Vulnerability to Poverty in Rural Vietnam:

Data Collection Issues, Coping Strategies and Crisis Events

Von der Wirtschaftswissenschaftlichen Fakultät der

Gottfried Wilhelm Leibniz Universität Hannover

zur Erlangung des akademischen Grades

Doktor der Wirtschaftswissenschaften

- Doctor rerum politicarum –

genehmigte Dissertation

von

Tung Phung Duc, M.Sc.

geboren am 20.02.1974 in Bacninh (Vietnam)

2011

Erstgutachter: Prof. Dr. Hermann Waibel

Institut für Entwicklungs- und Agrarökonomik

Wirtschaftswissenschaftliche Fakultät

der Gottfried Wilhelm Leibniz Universität Hannover

Zweitgutachter: Professor Stephan Klasen, PhD

Professur für Volkswirtschaftstheorie

und Entwicklungsökonomik

Georg-August-Universität Göttingen

Tag der Promotion: 13. Januar 2012

Acknowledgements

I highly appreciate and thank all those who had supported and encouraged me to make this thesis possible.

I would like to give my special thanks to Prof. Dr. Hermann Waibel for giving me the opportunity to conduct this research and for his strong support and encouragement. He has given me good guidance and intellectual advices as well as highly constructive comments. Without his support and encouragement, my research ideas and my PhD works could have not become reality.

I would also like to thank Prof. Dr. Stephan Klasen for serving as an examiner and for helpful comments on my research in the course of implementing DFG FOR 756. I also want to thank Prof. Dr. Daniel Westbrook, Prof. Dr. Erich Schmidt and Dr. Toan Quy Do for their valuable comments and careful review of different chapter of my thesis.

The thesis could not be completed the huge support from numerous individuals and institutions. I would like to thank the data collection teams who had tried with their best capacity to ensure that the data was collected at high quality. Also, I would like to express my great gratitude to the surveyed households in six provinces in both countries for providing invaluable information for my research. I would like to thank the Centre for Rural Development in Central Vietnam (CAP), Ministry of Agriculture and Rural Development (MARD) in surveyed provinces for their logistic supports to the survey teams as well as the field trips of the supervisors. I would like thank to the German Research Foundation (DFG) for the financial support through the DFG-funded research unit DFGFOR756 on the "Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies". Many thanks to General Statistics Office of Vietnam for allowing me to access the Vietnam Living Standard Household Surveys data.

Special thanks are extended to all of my colleagues at the Institute of Development and Agricultural Economics Leibniz University of Hannover who provided valuable comments for this thesis and supported me in academic and

administrative matters as well as giving me emotional support, especially during my time in Hanover. I especially want to mention Dr. Marc Völker, Dipl. Ök. Lena Hohfeld, Dipl. Ök. Vu Thi Hoa and M.Sc. Nguyen Duc Loc for their help in editing the thesis. I also would like to thank my colleagues at the Institute for Environmental Economics and World Trade for their support and encouragement.

Finally, I would love to thank all of my family members, my wife and my kids, my friends. They have made me strong and given me the confidence to complete my works. To my parents, thank you for your encouragement. To my wife, Nga, thank you for your love, trust and for taking care of our kids. To my kids, Van and Phong, thank for your love and encouragement.

Zusammenfassung

Ländliche Haushalte in Schwellenländern wie Vietnam sind oft mit Unsicherheiten durch Naturkatastrophen, unvollkommene Märkte und verfehlte Politikmaßnahmen konfrontiert. Darüber hinaus stellten Globalisierung und Liberalisierung der Märkte ländliche Haushalte vor große Herausforderungen. Globale Krisen wie die Finanzkrise oder die Nahrungsmittelpreiskrise von 2008 erreichen auch ländliche Haushalte in abgelegenen Gebieten. In der Folge steigen Einkommensrisiken für diese Haushalte und machen sie anfällig gegenüber Makro- und Mikroschocks. Für die Messung der Effekte solcher Prozesse und Ereignisse werden umfassende empirische Daten benötigt, die repräsentativ für bestimmte Regionen sein müssen sowie über einen längeren Zeitraum identische Haushalte abdecken sollten.

Diese Dissertation stützt sich vor allem auf Daten, die 2007 und 2008 unter dem DFG finanzierten Projekt "Impact of shocks on the vulnerability to poverty: consequences for the development of emerging Southeast Asian economies" in drei Provinzen in Vietnam (Ha Tinh, Hue und Dak Lak) sowie in drei Provinzen in Nordost- Thailand (Buri Ram, Ubon Ratchathani und Nakhon Phanom) erhoben wurden. In jedem Land wurden dazu 2200 Haushalte zufällig ausgewählt und in beiden Jahren befragt. Zusätzlich wurden in dieser Dissertation Datensätze des Vietnam Living Standard Surveys von 2006 und 2008 verwendet.

Die Dissertation untersucht drei Bereiche aus dem Themengebiet Vulnerabilität ländlicher Haushalte in Schwellenländern gegenüber Armut. Der erste Bereich betrifft die Datenerhebung zur Messung der Vulnerabilität. Zweites wird die Frage erläutert, inwieweit Diversifizierung von Land und Arbeit eine wirksame Maßnahme gegenüber Risiken und Schocks darstellt. Als dritter Aspekt werden die Anpassungsmaßnahmen ländlicher und städtischer Haushalte in verschiedenen Regionen Vietnams für einen bestimmten Typ Schocks, die Nahrungsmittelpreiskrise 2008, analysiert.

Die Dissertation ist in sechs Kapitel unterteilt. Im ersten Kapitel wird der Hintergrund der behandelten Problematik erläutert und die Forschungsziele

werden herausgestellt. Zusätzlich wird ein kurzer Abriss des Inhaltes der Dissertation präsentiert.

Kapitel zwei zeigt die Ergebnisse der Untersuchung zur Datenqualität. Die Arbeit basiert auf der Beobachtung, dass in komplexen Haushaltsbefragungen in Entwicklungsländern mit dem Ziel der Erhebung einer empirischen Datenbasis für Vulnerabilitätsschätzungen die Qualität der Daten eine entscheidende Rolle spielt.

Die Datenqualität bei Befragungen wird von zwei Arten Fehler beeinflusst, dem Stichprobenfehler sowie dem Nicht-Stichproben Fehler (non- sampling error) bestimmt. Während viele Studien sich mit dem Stichprobenfehler beschäftigen, wurde dem Nicht-Stichproben Fehler bisher wenig Aufmerksamkeit gewidmet. Während der Stichprobenfehler durch eine entsprechende Gestaltung der Stichprobe minimiert werden kann, verlangt eine Reduktion des Nicht-Stichproben Fehlers Anpassungen in der Organisation und im Management einer Haushaltsbefragung. Da dieser Fehler vor allem von menschlichem Verhalten beeinflusst wird, stellt er gerade in Entwicklungsländern ein großes Problem dar. Mögliche Lösungsansätze können vor allem aus sozialwissenschaftlichen Theorien abgeleitet werden. In Kapitel zwei werden Einflussfaktoren des Nicht-Stichproben Fehler identifiziert. Dabei wird herausgestellt, inwieweit der Nicht-Stichproben Fehler die Schätzung die Konsumausgaben des Haushaltes beeinflussen, da letzter ein entscheidender Parameter zur Messung der Vulnerabilität darstellt. Die Ergebnisse zeigen, dass sowohl die Interviewsituation als auch Merkmale der Interviewer und die des Befragten einen signifikanten Einfluss auf den Nicht-Stichproben Fehler haben. Eine kürzere Interviewdauer, die Auswahl eines geeigneten Interview-Zeitpunktes und –Umgebung, sowie eine bessere Abstimmung von Charakteristika der Interviewpartner können den Nicht-Stichproben Fehler reduzieren. . Um eine hohe Qualität der Daten zu gewährleisten, müssen zur Reduzierung des Nicht-Stichproben Fehlers Anpassungen im Managementprozess komplexer Haushaltsbefragungen vorgenommen werden. Auch die Berücksichtigung von Migranten im Haushalt während des Interviews hat einen Einfluss. Daher sollten ländliche Haushaltsbefragungen in Schwellenländern möglichst auch eine

simultane Befragung der Mitglieder der ländlichen Haushalte einschließen, die als Migranten in städtischen Gebieten arbeiten.

Kapitel drei und vier erläutern den Einfluss von kovariaten Schocks und Risiken auf die Bewältigungsstrategien und das Risikomanagement von ländlichen Haushalten, in erster Linie auf die Diversifikation von Land und Arbeit. Dabei beschränkt sich die Analyse in Kapitel drei auf Vietnam, untersucht den Einfluss von kovariaten Schocks und Risiken auf die Diversifikation von Land und Arbeit und misst deren Einfluss auf die zukünftige Wohlfahrt der Haushalte. Unter Verwendung von Daten, die in 2007 und 2008 erhoben wurden, werden zwei Diversifikationsindizes definiert. Die Ergebnisse zeigen, dass Haushalte Diversifizierung in der Pflanzenproduktion sowohl als ex-post als auch als ex-ante Risikomanagementstrategie anwenden. Hingegen stellt die Diversifikation der Arbeitskraft eine ex-ante Strategie für Haushalte dar, die einen hohen Grad an Risikoaversion aufweisen.

In Kapitel vier wird die Analyse aus Kapitel drei bezüglich zweier Aspekte ausgeweitet. Erstens wird der Einfluss der Diversifikation auf zukünftigen Konsum und und deren Auswirkungen auf die Armutsitation in den Untersuchungsgebieten analysiert. Zweitens wird die Situation in Vietnam mit der in Thailand verglichen. Die Ergebnisse zeigen, dass ländliche Haushalte in beiden Ländern Diversifizierung als Selbstversicherungsmaßnahme sowohl für ex-post als auch für ex-ante Strategie nutzen. Es gibt allerdings auch Unterschiede, die größtenteils auf die sozioökonomische Situation in den beiden Ländern zurückzuführen sind. Ländliche Haushalte in Vietnam sind stärker wetterbedingten Schocks ausgeliefert und erwarten darüber hinaus höhere landwirtschaftliche Risiken; daher diversifizieren sie ihre Pflanzenproduktion stärker. Diese Haushalte haben sowohl einen höheren zukünftigen Konsum, als auch ein geringeres Risiko unter die Armutsgrenze zu fallen. In Thailand führt ein hoher Grad an Arbeitskraftdiversifikation zu einem geringeren Armutsrisiko. Der länderübergreifende Vergleich ermöglicht wichtige politikrelevante Schlussfolgerungen. Erstens ist eine Reduzierung der Vulnerabilität in Thailand am besten durch die Stärkung von off-farm Beschäftigungsmöglichkeiten möglich. Der Verbesserung der Sekundärschulbildung und der beruflichen

Fähigkeiten der ländlichen Erwerbsbevölkerung sollte daher mehr Aufmerksamkeit gewidmet werden. In Vietnam kann eine Reduzierung der Vulnerabilität vor allem durch den Auf- und Ausbau von Infrastruktur in den Bereichen Transport, Bewässerung und Finanzinstitutionen erreicht werden.

Kapitel fünf analysiert den Einfluss der Nahrungsmittelpreiskrise 2008 auf Wohlstand und Armut in Vietnam mithilfe des Vietnam Household Living Standard Surveys (VHLSS) 2006 und 2008. Dieses Kapitel zeigt, dass die steigenden Nahrungsmittelpreise sich zwar insgesamt positiv auf den Wohlstand vietnamesischer Haushalte ausgewirkt haben, dabei die Gewinne jedoch ungleich verteilt waren. So haben mehr Haushalte durch die gestiegenen Preise Wohlstandsverluste hinnehmen müssen, als Haushalte besser gestellt wurden. Die Nahrungsmittelpreiskrise hat somit nicht nur die Anzahl der in Armut lebenden Haushalte ansteigen lassen, sondern auch das Ausmaß der Armut von unterhalb der Armutsschwelle lebenden Haushalte vergrößert. Der Einfluss auf Armut variiert dabei zwischen den Regionen. Dies kann darauf zurückgeführt werden, dass die Preissteigerungen nicht homogen alle Nahrungsmittel und Haushaltstypen betrafen. Diese Ergebnisse bestätigen weitere Studien, die herausstellen, dass die kurzfristigen Nachfrage- und Angebotselastizität gering ist. Auf der anderen Seite wurde vor allem für die ärmeren Haushalte ein starker Substitutionseffekt zugunsten billiger Nahrungsmittel mit geringerer Qualität festgestellt.

Kapitel sechs fasst die wichtigsten Ergebnisse, Erkenntnisse und Politikempfehlungen dieser Dissertation zusammen. Dabei wird herausgestellt, dass die Arbeit vor allem zum Thema der Datenqualität bei Befragungen zur Vulnerabilität in Entwicklungsländern Erkenntnisse geliefert hat. Darüber hinaus hat die Arbeit zum besseren Verständnis der Rolle von Schocks und Risiken und deren Einfluss auf die Diversifikationsstrategien ländlicher Haushalte sowie deren zukünftigen Konsumniveau und deren Anfälligkeit gegenüber Armut beigetragen. Aus den Ergebnissen der Arbeit werden Vorschläge für die weitere Forschung und für die Politik abgeleitet. Diese beziehen sich auf die Erhebungen die im Zusammenhang mit Forschungen zur Vulnerabilität durchgeführt wurden sowie auf Politikmaßnahmen zur Reduktion des Einflusses von Schocks und

Risiken auf die Anfälligkeit ländlicher Haushalte gegenüber Armut in wachsenden Volkswirtschaften in Südostasien.

Schlüsselbegriffe: *Nichtstichprobenfehler, Datenqualität, Schocks, Risiken, Bewältigungsstrategien, Nahrungsmittelkrise, Armutsanfälligkeit, Armut, Vietnam*

Abstract

Rural households in emerging market economies like Vietnam often face many uncertainties stemming from natural disasters, market imperfections and misguided policy regulations. They are also susceptible to the recent rapid socio-economic liberalization and globalization process. Hence, global crises like the financial crisis or the food price crisis of 2008 can have profound effects on rural households even in remote areas. As a result, income risk is rising, making rural households vulnerable to both covariate and idiosyncratic shocks. To measure the impact of such phenomena on the welfare of households, on poverty and vulnerabilty requires a comprehensive empirical data base representative for defined areas and collected over a longer period, preferably from identical households.

The thesis mainly uses survey data collected under the DFG-funded research[1] on the "Impact of shocks on the vulnerability to poverty: consequences for the development of emerging Southeast Asian economies" in 2007 and 2008 in three provinces in Central Vietnam (Ha Tinh, Hue and Dak Lak) and three provinces in North East Thailand (Buri Ram, Ubon Ratchathani and Nakhon Phanom). Some 2200 households were randomly selected in each country in both years. In addition, data sets of the Vietnam Household Living Standard Survey (VHLSS) conducted in 2006 and 2008 were used in this thesis.

The thesis adresses three major issues connected to the theme of vulnerability to poverty of rural households in emerging market economies. The first topic is dealing with the problem of data collection for vulnerability assessments. The second topic is connected to the question of diversification in response to shocks and risks. Here analysis was performed for householdsin Vietnam and in additonal comparsion between Thailand and Vietnam. The third topic addresses a particular type of shock, namely the 2008 food price crisis and the analysis of

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[1] Deutsche Forschungsgemeinschaft (DFG) Research Unit 756 (see http://www.vulnerability-asia.uni-hannover.de/)

the adjustment measures taken by rural and urban households in different regions of Vietnam.

The thesis is organized around six chapters. In the first chapter the problem background is described and the objectives of the research are specified. In addition an outline of the succeeding chapters is given. Chapter 2 addresses the non-sampling error by analyzing the factors that affected data quality and by measuring the impact of covariate shocks and risks on the diversification of household's portfolio and on the poverty, and by evaluating the effects of these coping strategies on the future welfare and poverty of these households.

Due to the absence or impefection of formal insurance and credit markets, households living in high-risk environments have to adopt self- insurance mechanisms to cope with shocks and risks. One of the self-insurance methods of rural households is to diversify their income portfolio. Most researches have analyzed income diversification in the context of economic growth and poverty; these analyses did not always adequately capture the dynamic nature of poverty due to the lack of time- series data on shock events. Chapter 3 and 4 present the impact of covariate shocks and risks on the land and labor diversification of the farmers and measure the impacts of these diversifications on the future welfare and vulnerability to poverty of the households, taking into account the differences in socio- economic conditions in Thailand and Vietnam. The last chapter demonstrates the impact of the recent food price crisis on the welfare and poverty of the households in Vietnam. Overall, this thesis confirms the fact that household in developing countries have developed their own coping strategies with respect to external shock and risk. However, the selection of coping strategies depends on the situation and characteristics of each household, location and country.

Chapter 2 presents the results of the paper on sampling. It is based on the notion that in complex household surveys in developing countries with the purpose to establish the empirical basis for vulnerability assessments data quality plays an important role. Data quality issues are related to the sampling and non- sampling error. While the sampling error has been subject to many studies the problem of

non- sampling errors has received less attention. It is possible to control the sampling error by an efficient sampling design and an appropriate sampling method, reducing the non- sampling error is a complex issue related to survey organization and management. Especially in developing countries, the non-sampling error can be considered as a serious problem since this type of error is related to human behaviors, which requires social science theories to generate potential solutions to this problem. In chapter 2, the sources of non-sampling error and the factors that affected the non-sampling error are defined. It is also examined whether these factors could affect the estimation of the household's consumption, as the latter is a crucial parameter for vulnerability assessments. The results of the analysis show that interview environment, interviewer and respondent characteristics have a significant impact on the non-sampling error. The non-sampling error could be reduced substantially by shortening the length of an interview, selecting a suitable time for conducting the interview, interviewer selection and matching interviewer and respondent characteristics. It concludes that issues of non-sampling error need to be addressed during the management process of complex household surveys in order to ensure high quality data for researches on vulnerability. In addition, the issues of migratory household members are an important aspect. Thus rural household surveys in emerging market economies are best conducted simultaneous a survey of migrants who belong to rural household included in the survey.

Chapter 3 and 4 are related. Both address the question of the impact of covariate shocks and risks on coping strategies and risk management of the rural households, mainly on diversification in labor and land. Using two different diversification indices and restricting the analysis to the 2007 and 2008 data in Vietnam shows that households widely apply self-insurance mechanisms to cope with shocks. The analysis provides evidence that households adopt crop diversification for both ex-post coping and ex-ante risk management. However, labor diversification was found to be mainly an ex-ante measure relevant for the high-risk adverse households.

Chapter 4 extends the analysis conducted in chapter three in two ways. First, diversification impact on welfare and poverty is addressed. Second, the analysis

compares the situation in Vietnam with those in Thailand. Results show that rural households in both countries use diversification as self- insurance mechanism for ex-post and ex-ante coping. However, there are differences, which are largely in accordance with socio-economic conditions. Rural households in Vietnam, who are confronted with more weather-related shocks and who expect more agricultural risks, tend to diversity their land for various agricultural activities. Households who diversify tend to enjoy higher future consumption and are less likely to fall into poverty in future. In Thailand, households with higher levels of labor diversification are less likely to be poor in the future. The cross-country comparison allows some important policy conclusions. First, in Thailand reducing vulnerability to poverty is best achieved through the promotion of non-farm job opportunities. Thus, more attention should be given to improving secondary education and skills for the rural labor force. In the case of Vietnam, reducing vulnerability would be best achieved through the construction and upgrading of infrastructure in the areas of transportation, irrigation and financial institutions.

Chapter 5 analyzes the impact of the 2008 food crisis on welfare and poverty in Vietnam using a different data set namely the Vietnam Household Living Standard Survey (VHLSS) of 2006 and 2008. This chapter shows that rising food prices overall had a positive effect on the welfare of household in Vietnam. However the gains were rather uneven, more households lost that those who gained from the rise in food price. Hence, the rising food price did not only increase the number of poor people but also increased the poverty gap. Also, the impact on poverty varied by regions. This may be because price movements of the food items were not homogenous among food items and among types of households. The results confirm findings of related studies that both short run supply and demand elasticity is only moderate. On the other hand, a strong substitution effect towards less expensive, lower quality food was found for the poorer consumers.

Chapter 6 discusses on the main contributions, findings and policy implications of the thesis. The chapter concludes that the thesis has filled on the gaps of the current studies on the data quality of the vulnerability survey in developing

countries, on the evaluation of the covariate shocks and risks on the diversification strategy of the affected households and their coping strategies on the future welfare and vulnerability to poverty. The thesis illustrates some policy implications for implementing vulnerability surveys and provides suggestions for governments in developing countries to develop specific policies effective to reduce the impact of shocks and risks and hereby reduce vulnerability to poverty of rural households.

Keywords: *non- sampling error, data quality, shocks, risks, coping strategies, food crisis, vulnerability, poverty, Vietnam*

Table of contents

List of tables

List of figures

List of abbreviations

2SLS- Two-stage least squares

CGIAR- Consultative Group on International Agricultural Research

CPI- Consummer Price Index

DFG - Deutsche Forschungsgemeinschaft (German Research Foundation)

FAO - Food and Agriculture Organization

FC- Food Consumption

FI- Food income

GDP - Gross Domestic Product

GSO - General Statistics Office of Vietnam

Ha - Hectare

HH- Household

IFAD- International Fund for Agricultural Development

IV- Instrumental variable

MARD - Ministry of Agriculture and Rural Development of Vietnam

NFC- Non-Food Consumption

NFI- Non-Food Income

OLS - Ordinary least squares

PL - Poverty Line

SID- Simpson Index of Diversity

SW- Shannon-Weaver index

UNDP - United Nations Development Programme

VHLSS- Vietnam Living Standard Survey

VND - Vietnam Dong

WB – World Bank

Chapter 1

Introduction

1.1 Problem Background

Vietnam is an emerging market economy where the agricultural sector still plays an important role even though its contribution to GDP has reduced from 40% in 1985 to around 22% in 2008, respectively (GSO 2009). In the rural areas, agriculture is the major source of income and of employment. Income from agriculture accounted for 49% of total income of rural household and 58% of total income of poor rural households in 2008. In addition, the agricultural sector absorbed more than a half of total labor force in rural area in 2008 (GSO 2008). As a result of policy reforms Vietnam to date has become a major player in the world food markets. For example, the country now ranks third among the world's leading rice exporters. However, Vietnam's economic policy reform has also introduced risks particularly for the rural areas. A stronger integration into the world economy with less trade protection and reduced subsidies has exposed the domestic market to the fluctuations of the international markets. Also high weather risks such as storms, floods and droughts are typical threats for a large part of Vietnam's agricultural areas. Drought is recurring in the Central Highlands, while floods, typhoons, and storms are common in the North Central Coast (Chaudry and Ruysschaert 2007). Vietnam in recent years has also been strongly affected by livestock diseases such as the Avian Flu and Foot and Mouth disease. These threats on rural households have created negative impact in the economy. In addition, the climate change has increased the likelihood of natural disasters in the country. A recent study by Dasgupta et al. (2009) on the potential impacts of sea level rise in 84 coastal developing countries showed that

a 1-meter rise in sea level would affect about 7 percent of agricultural land and 11 percent of the population, which could further reduce the agriculture sector's GDP by 10 percent. The highly diverse geographic and geomorphologic conditions in Vietnam have led to large heterogeneity of agricultural systems including highly diversified subsistence agriculture in the marginal, mostly mountainous areas and specialized farming in the more favored regions.

Rural households in Vietnam, like in many other developing countries face uncertainties stemming from extreme weather conditions, market imperfections, and misguided policy regulations, in addition to the recent rapid liberalization and globalization process. Hence, income risk is generally high, making especially rural households vulnerable to covariate and idiosyncratic shocks (Dercon 1999). The absence or partial existence of formal insurance and credit markets (Besley 1994) prompts households to adopt self- insurance mechanisms. In fact, households living in high risky environments have developed rather sophisticated (ex-ante) risk- management and (ex-post) risk-coping strategies (Dercon 1999). One of the coping strategies is to diversify into different income generating activities in order to minimize income fluctuation and to smooth consumption. To implement this strategy, households can diversify their resources into different production activities that have either negative or low correlation with income. For example, a household can select and grow different crops in different plots of land such that the price and productivity levels of these crops are low-correlated with one another. Also a household could move part of its labor from agriculture into non- agricultural activities. This diversification strategy is both an ex-post coping and ex-ante risk management measure when insurance and credit markets are either missing or imperfect (Ersado 2006). Diversification is often adopted by households who live in remote areas where access to input and output markets is poor. Therefore, they have to diversify their cropping system in order to meet their food consumption needs. A household may also adopt diversification to exploit strategic complementarities and positive interactions between activities, as well as to simplify aggregation effects where the returns to assets vary by individuals or across time and space.

The actual degree of diversification of a household depends on several factors. First a households' income and consumption ability, i.e. household with high income volatility are more likely to diversify their portfolio than those with less volatility. Households tend to invest more (specialize) on the activity that gives higher return if they have better access to credit or other resources to smooth their consumption during the income shock time. The second factor is households' risk aversion level. Households with high risk aversion are more likely to diversify their investment into various income generating activities than households with low risk aversion level. The cost of diversification is the third factor, i.e. the amount of income reduction for reducing risk. Higher risk usually is accompanied with a higher probability of high return. Reducing income risk by selecting a mixture of activities whose net returns have a low or negative correlation, is a major strategy of self-insurance based on risk management (e.g. Di Falco et al. 2009, Just and Pope 2003, Dunn 1997, Reardon et al. 1992). Diversification through combining activities with low positive covariance and income-skewing effects is a measure traditionally employed by risk-averse small-scale farmers in developing countries.

Most studies relating to diversification have investigated the impact on expected mean and variance of income (e.g. Lanjouw et al. 2001; Ersado 2006). These analyses mostly ignored the role that environmental and economic shocks play when poor farmers decide to diversify their sources of income. However, when developing a strategy to reduce vulnerability to poverty, assessing the role of activity diversification should be considered (see CGIAR 2005; Slater et al. 2007; IFAD 2008; Tingem and Rivington, 2009). Since previous studies had showed that agricultural diversification can help to reduce income risk, this strategy can be effective in poverty reduction (Barghouti et al. 2004; Ahmad and Isvilanonda 2003; Pingali 2004). Nevertheless, it is less clear as to what extent diversification can be an effective strategy to reduce vulnerability to poverty in the rural areas of emerging market economies.

In developing countries, the recent food price crisis has caused many people falling back into poverty. Especially for countries who are net food importers, a food price crisis could lead to social and political instability. It has been

estimated that the 2008 food price crisis could has made 100 million more people falling into poverty (Ivanic & Martin 2008) and increase the number of malnourished people in the world by up to 44 million in 2008 (World Bank, 2008). While the macroeconomics impacts of rising food price are clear, less is known about the microeconomic effects of such events (Derek, et al. 2008). In most of current papers that evaluated the impact of food crisis on welfare and poverty (Zezza et al. 2008; Dessus et al. 2008; Wodon et al 2008; Arndt et al. 2008; and Vu et al. 2011) there are a number of limitations. These papers looked at the changes in food prices but do not taken into account the changes in the cost of the food production. Secondly, these researches assumed that the food price increased at the same level among the countries, regions or among the food items. In fact, different countries are faced with different level of food price increase depending on their trade policies and the bearing of the transportation costs. Thirdly, they do not consider the impacts on the supply and demand sides. Moreover, these papers assumed that food price increase has fully transferred into the income of producers. However, the food price increase could partly benefit producer and the benefit level varied in accordance with production location. With these limitations due to lack of adequate data after the rising food price, Derak et al. (2008) concludes that "Ultimately, we still need to learn much more about actual price changes, the additional impacts of increased fuel and fertilizer prices, the short- term behavioral responses to rising food price, and about how government policies can influence these outcomes".

Understanding coping strategies and impact of the food crisis on poverty is important for policy makers and for international organizations in order to enable them to take appropriate actions from sufficient researches and policies. To carry out such research sound methodologies and high quality data are required. Data from household surveys play an important role in applied research and policy purposes. Different types of errors, namely sampling and non-sampling errors can impair data quality from surveys. While the sampling error is often controlled by good sampling design method, the non- sampling error is difficult to measure. Research on sampling methods has a long history with practical rules for sampling design as the most important contribution

(Grove, 1989). The non- sampling error is considered is a serious problem in census and survey especially in developing countries. However, little attention has been paid on scientific research of non- sampling error problems. To study non- sampling errors economic concepts are insufficient. Instead, behavioral theories from other social sciences are necessary which are not always easy to combine with economic theories.

Recent studies on non-sampling error concentrated on the relationship between background characteristics of interviewers and non- response. Fowler and Manginone (1990) found that male interviewers were less likely to receive a good cooperation from respondents as compared to female interviewers. Lessler and Kalsbeek (1992) found evidence that male interviewers have a lower response rate than female interviewers. While Lievesley (1986) showed that middle-aged interviewers had higher response rates than younger or older interviewers, Morton- Williams (1993) did not support this finding. Singer et al. (1983) found that the highest response rates came from the older interviewers. Survey experience is highly correlated with the response rate (Durbin and Stuart, 1951; Lievesley, 1986; Couper and Grove, 1992). Campanelli, Sturgis and Purdon (1997) looked the impact of the same interviewers return to the same respondents on the response rate in longitudinal survey and found that interviewer continuity is more important at earlier rather than later waves of the survey. Bonke and Fallesen (2010) found that the quality of data from the web interviews could increase significantly by incentives for respondents. Considering the absence of rigorous studies on non- sampling error an econometric has been carried out using the 2007 and 2008 rural household data base in Vietnam and Thailand. The study presented in chapter two allows the identification of the factors that affect the non- sampling error and examine to what extent these factors affect the consumption and income of the surveyed household.

This thesis focuses mainly on the situation in Vietnam using the data from Vulnerability Survey conducted in 2007 and 2008 under the DFG research project 'Impact of Shocks on the Vulnerability to Poverty: Consequence for Development of Emerging Southeast Asian Economies, and the Vietnam

Household Living Standard Survey (VHLSS) 2006 and 2008. However, the research also allows some comparison between Vietnam and Thailand regarding coping strategies of the households in both countries.

1.2 Research objectives

This study contributes to research on vulnerability to poverty of rural households in Vietnam and Thailand by addressing several related issues:

(i)   analyzing the factors that affect data quality in particular the non-sampling error in household surveys in Thailand and Vietnam;

(ii) measuring the impact of covariate shocks and risks on the diversification of rural household's portfolio in Vietnam;

(iii) evaluating the effects of coping strategies on the future welfare and the vulnerability to poverty of the households in Thailand and Vietnam;

(iv) assessing the impact of the 2008 food price crisis on welfare and poverty in Vietnam.

The overall objective of the thesis is to contribute to a better understanding of the role of covariate shocks and risks for rural households in Vietnam, to examine their impacts on vulnerability to poverty at household level and to evaluate the role of household's portfolio diversification as important ex-post shock coping and ex-ante risk management strategies. To reach the overall objective, three specific objectives were formulated:

1. To analyse the sources of non-sampling errors in rural household surveys for vulnerability assessment in Thailand and Vietnam and to identify the factors that affect such errors including their effect on consumption and income. The results will help to improve organization and management in order to assure data quality of the additional panel waves and similar type of surveys in developing countries. To achieve this objective a range of specific questions need to be answered: (a) Does the sampling frame affect the non- sampling error due to the coverage error? (b) Do factors related to the interview environment affect the non- sampling error? (c)

Do interviewer characteristics influence the non- sampling error? (d) Do respondent characteristics play an important role? (e) Does the interview environment and the interviewer and respondent characteristics have different effects on different types of non- sampling error?

2. To analyze the role of shocks and risks for land and labor diversification of rural households in Vietnam and draw comparison with the situation in Thailand also well taking into account the impact of diversification on welfare and vulnerability to poverty. To achieve this objective the three major research questions need to be answered: (a) Do rural households in Vietnam use land and labor diversification as ex-post coping and ex-ante risk management strategies to cope with covariate shocks and risks? (b) Do rural households in Vietnam use different coping as compared to rural households in Thailand and if so what are the reasons for such difference? (c) What is the effect of diversification on welfare and vulnerability to poverty of rural households in both countries?

3. To examine the impact of the 2008 food price crisis on welfare and poverty of households in Vietnam. Specifically, this paper provides in-depth analysis of the impact on income, food security and poverty on different groups of household. The special contribution of this analysis is to capture the effects of net price changes, the impact of increased fuel and fertilizer prices and the short- term behavioral responses to rising food price (Derek et al.; 2008). To achieve these objectives the following questions must be answered: (a) To what extent, the net change in food price affects welfare and poverty of the households? (b) Who are the winners and the losers of the food price crisis and how are they distributed across regions in Vietnam? (c) How do the households respond to the rising food prices in short-term?

1.3 Outline of the thesis

The thesis consists of 6 chapters. Chapters 2 to 5 present the core findings of the thesis. These chapters were originally written as separate papers to be

submitted to scientific journals. Chapter 6 discusses the main findings and provides policy recommendation.

In chapter 2, the paper on non- sampling error is presented. The paper uses the first two waves of the rural household survey in Thailand and Vietnam in 2007 and 2008 for the collection of data suitable for vulnerability assessment. The paper identifies the sources of non- sampling error and their effects on the estimation of household consumption and income, which are decisive components in vulnerability assessments. A detailed description of the survey implementation and the identification of the types of the non- sampling error are provided before evaluating the coverage error of the survey. Both random and fixed effect models are used to measure the impact of interview environment, the interviewer and respondent characteristics and their interaction on different types of non- sampling errors. The major findings and some policy recommendations are discussed in the last section of the chapter.

Chapter 3 analyses the role of covariate shocks and risks in land and labor diversification of the rural household in three surveyed provinces in Vietnam. This paper discusses the theory of diversification, related measurement methods, including the Simpson Index of Diversity (SID) and the Shannon-Weaver index (SW) for the measurement of land and labor diversification. Chapter 3 also measures the impact of these factors on of the income portfolio and the cropping system of rural household. It draws policy implications and submits recommendations for improving the social and physical infrastructure in rural areas of Vietnam.

Chapter 4 compares the diversification strategy of the rural households in Thailand to those in Vietnam and examines the effects of the land and labor diversification on welfare and vulnerability to poverty of rural households. Conceptually the paper follows the approach taken on chapter 3 to measure the land and labor diversification and evaluate the impacts of shocks and risks on these indicators. An instrumental variable approach (IV) is used to measure the effects of land and labor diversification on the household's future consumption and poverty. The analysis is performed separately for each country in order to

capture but inferences are drawn against the background of differences in the socio- economic conditions.

Chapter 5 examines the impact of the food price crisis on the welfare and poverty in Vietnam using Vietnam Household Living Standard Surveys of 2006 and 2008. The chapter discusses causes and consequences of the food price crisis. An overview of the agricultural sector and the poverty situation in Vietnam is presented. Methodologically, the paper uses a decomposition approach that allows at the analysis of the impacts of net price changes on welfare and poverty and the short- term response of different households. The assessment is carried out an aggregate of food items and for rice separately. The effects are decomposed into different components namely price, quantity and their interaction, household below and above the poverty line, net buyer and net seller as well as regions.

Chapter 6 summarizes the main findings and derives some policy implications. It discusses the key findings from chapter 2 to chapter 5 and the contributions of the thesis on the current studies. In addition, it also gives some policy recommendations for the Government of Vietnam and point to the need develop more specific policies for reducing the impact of shocks and risks on vulnerability to poverty for rural households.

Chapter 2

Non-sampling Error and Data quality[2]

2.1 Introduction

Empirical research on economic well-being, poverty and vulnerability requires adequate methodologies and high quality data. Oftentimes data are used which were collected for other purposes and where the circumstances of data collection and the problems encountered during the survey are unknown leading to possible misinterpretation of results. Research on vulnerability to poverty is, therefore best carried out with specifically designed questionnaires. However, household surveys especially in rural areas of developing countries are challenging because of the problem to control sampling as well as non- sampling errors. Sampling errors usually can be controlled by choosing an appropriate sampling design, methodology and sample size (e.g. Grove, 1989). In planning surveys, one can choose a sampling design that assures the representation of different groups in the sample and increases the probability of selection of small subgroups subject to the usual budgetary constraints. However, less research has been carried out on how to better manage the non- sampling errors.

We argue that there is a need to better understand the role of the non- sampling error and finding innovative ways to control it. In addition, it is also important to

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[2] This chapter is a revised version of the paper: Tung, D. P., Hardeweg, B., Praneetvatakul,S., and H. Waibel (2010), "Non-sampling Error and Data quality: What can we learn from Surveys to collect Data for Vulnerability Measurements? " It is intended to submit this paper to a special issue of *World Development*

recognize that a trade-off can exist between sampling and the non- sampling error. For example, while the former can be reduced by increasing the sample size, the non- sampling error can go up due to problems in managing the survey. Although non-sampling errors are considered as a problem in the conduct of censuses especially in developing countries, much less attention was given to the causes and consequences of non-sampling errors, which can occur in surveys. There may be many reasons for this. One of them might be a perception that it is largely a non- issue as long as the results of econometric modeling exercises yield reasonable results (why would we want to know?). Another one could be related to the fact that studying the non- sampling errors of surveys is at the margin of what economists are normally doing as it requires looking into concepts and theories of the behavioral sciences.

In the literature, generally three types of the non-sampling error have been defined (e. g Grove, 1989; Banda, 2008): (i) coverage error, (ii) non- response error and (iii) measurement error. The coverage error occurs when the sampling frame, i.e. the list from which the sample is chosen, does not sufficiently cover the target population. A coverage error includes both, under-coverage, namely the failure to include important sampling units. Over-coverage means that untargeted respondents are included in the sample. The coverage error occurs already during the sampling design phase and is a result of insufficient information about the chance of a sampling unit to be included in the sample (Dillman, 2007).

The non-response error refers to the failure to obtain the intended information from respondents. This can be due to inaccessibility of the respondent as well as her refusal or inability to respond. It may also result from the questionnaire design, which may render it irrelevant for some respondents. For example, if the target is agricultural households but the respondent turns out to be a non-agricultural household.

There are two types of non- responses, namely unit non-response and item non-response. While the unit non-response refers to the cases where a certain sample unit is missing, item non- response refers to the case where the information of a

sample unit is only partially collected. For example, data on the yield of a cropping activity is available but the respondent cannot remember details of cost of production.

The third type of the non- sampling error is the measurement error. It occurs when the data obtained are obviously incorrect or are different from actual values of the sample units. For example, if a respondent provides information on wage employment for unskilled and submits a wage value which triples the wage level for skilled labor.

Non-sampling errors can occur in every stage of the survey implementation. A list of sources for the non-sampling error was proposed by Banda (2008). This includes imprecise definitions, faulty methods of enumeration, inappropriate survey instruments, using ambiguous questionnaires, definitions or instructions, lack of trained and experienced field enumerators, inadequate field supervision as well as inadequate scrutiny of the basic data and errors in data processing operations such as coding, keying, verification, tabulation. For example, a poorly designed and improperly tested questionnaire could lead to many misunderstandings by both respondents and interviewers leading to measurement errors or to a large numbers of missing values. Incomplete sampling frames, more often than not a reality in developing countries, can contribute to the coverage error. Behavioral characteristics of the interviewers and the respondent as well as the interaction between them are some of the factors that can affect the non- response rate and lead to measurement errors. Insufficient organization of the data entry process could add to the measurement error by wrong data entry and such errors are rarely detected.

Most of the recent studies on non-sampling errors mainly look at the relationship between interviewer characteristics and the problem of non- response. For example, Fowler and Manginone (1990) found that male interviewers were less likely to receive a good cooperation from respondents than female interviewers. Lessler and Kalsbeek (1992) found evidence that male interviewers have lower response rate than female interviewers. While Lievesley (1986) showed that middle-aged interviewers achieved higher response rates than young or old

interviewer, the study of Morton- Williams (1993) did not support this finding. Singer et al. (1983) found higher response rates by older interviewers. Durbin and Stuart (1951), Livevesley, (1986) and Couper and Grove (1992) find that survey experience is highly correlated with the response rate. Campanelli, Sturgis and Purdon (1997) analyzed response rate in longitudinal surveys and found that interviewer continuity is important at earlier rather but less so in later survey waves. Bonke J. and Fallesen P. (2010) found that in web interviews incentives for respondents significantly increased the quality of data.

Glewwe and Dang (2008) analyzed the role data entry management and found that entering data in the field within one or two days of completing interview instead of doing it several weeks later in provincial statistics offices (i.e. the standard procedure) on the quality of data. They found that location and timing of data entry had no significant effect on the distribution of the household expenditures. However, they could show that immediate data entry, which facilitates communication with enumerators, can reduce the mean number of errors per household from 5 to 23 percent depending on the type of error. Fisher, Reimer and Carr (2009) found that when income composition has a strong gender focus interviewing only the household head did not produce statistically reliable results for poverty analysis. The paper showed for example that when men were asked about their wife's income considerable inconsistencies occurred.

This chapter identifies the factors affecting the non-sampling error using the data from a panel rural household survey for the measurement of vulnerability to poverty in Thailand and Vietnam. It also examines whether variables that explain the non- sampling error are also correlated with the consumption data of the surveyed household. The results of this study offer some recommendations how to reduce the effects of these factors on the quality of the data. Thus, lessons can be learned for further waves of the DFG survey and for similar household surveys in developing countries.

In the next section, a description of the organization and implementation of vulnerability surveys conducted in Thailand and Vietnam in 2007 and 2008 is

provided. This is followed a methodology section that includes a discussion of the variables that could explain such error by means of an empirical model. In section 2.4, results are presented and discussed and in the last section, it draw conclusions that could provide a good basis for surveys to facilitate poverty analysis in developing countries.

2.2 Description of household survey to measure vulnerability to poverty

The data to analyze sources of the non- sampling errors are taken from a large-scale survey under the research project "Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies"[3.] The major aim of this project is to advance theoretically and empirically the concept and the methodology of measuring vulnerability to poverty in the economic and political context of emerging economies in Southeast Asia. A panel survey among a total of some 4400 households in six provinces in Thailand and Vietnam has been conducted in 2007 and 2008. The questionnaire was designed with the specific aim to collect data that allow a better specification and empirical testing of the vulnerability to poverty concept. The survey instrument includes the usual parameters of household surveys like household characteristics, including education, health and household dynamics, household assets and resources, including the technical specification and the value of the household's residence, as well as the sources and amount of income from agriculture, small-scale business and wage employment. Furthermore, modules for borrowing, lending and public transfers and of course household consumption were included. Special attention was given to different types of shocks that the household experienced in the past and the perception of risk by the respondent. Special questions were designed to measure the respondent's risk attitude. The survey form was pre-coded and the codes included the possibility for "don't know" answer or "no answer". These answer options would allow to evaluate the sensitivity and the knowledge of the respondent about

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specific issues. In addition, the questionnaire contains also information about duration of interview, time started and time finished, and respondent information (age, sex and education). Information on interviewer characteristics was also available from secondary sources. The comprehensive household questionnaire comprised of 61 pages containing 420 variables. Multiple data rows per household (e.g. for data on each household member) lead to an average of 910 data items collected per household[4].

Subject to budgetary constraints, the sampling design aimed to obtain a representative sample of the target population of rural and peri-urban households by using an appropriate cluster sampling technique. The sampling procedure consists of a 2-stage cluster sampling design with an additional dummy stage. The cluster size of 10 households in a village was chosen based organizational aspects of the survey, i.e. the size of the survey team but is also in line with recommendations and prior information for Vietnam that homogeneity within villages is fairly high (Pettersson, 2003). The sampling frame for Thailand was obtained from two databases maintained by the Department of Community Development, Ministry of the Interior. The village-level database (NRC2D) provided the measure of size at the sub-district and village levels as of 2005. The household database (BMN) for the three provinces of 2006 became available at a later stage and was used as a listing frame for rural households including household size. Sampling frame for Vietnam was obtained from the most updated data that was taken from the Agricultural and Rural Census 2006, which covers all rural households and has been conducted by the Vietnam General Statistical Office. The difference in the sampling frame in two countries allows us to evaluate the non-coverage error when comparing the results of the key indicators from the sampling frame and the survey data.

Survey implementation was preceded by a one week training workshop for enumerators in each country. The training was intensive, with preparatory

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[4] A village head questionnaire of 3 pages and 95 variables was added to obtain information on village infrastructure, village economy and social problems.

plenary sessions, including evening gatherings, training in role plays and three field visits during which enumerators conducted household interviews in groups. In Vietnam, a final "exam" was used to rank prospective enumerators by their performance and understanding of the questionnaire.

Organization of survey differed between the two countries. In Thailand, one survey team with 13 members plus team leader and driver was established. For each survey day, the team would travel to a sub district to target two villages for interviewing 20 respondents, i.e. 2 respondents per enumerator and day. Two members of the team would remain at the provincial headquarters and conduct data entry. In Vietnam, two teams per province were established. These were mobile teams moving from commune to commune during the survey period. Each team consisted of four enumerators, one team leader and one data entry person. On each survey day, one enumerator would normally conduct two interviews. Hence, the team usually stayed for 3 days in one location. In the afternoon of the third day, the team would carry out questionnaire editing or collecting missing information before moving on to the next commune in the morning of the fourth day.

Data quality control was an essential part of the survey process and followed a formalized procedure as outlined in Box 2.1. A household survey form filled in by enumerator A would be checked for consistency and completeness by a colleague (enumerator B) shortly after the interview. In case of incomplete or inconsistent information, enumerator A could check the information again, either by phone (mainly Thailand) or by revisiting the household and resolve these problems. In addition, team leaders skimmed over all questionnaires before data entry and randomly checked the most important parts (shock and risk, income and consumption section) in detail. After clearance was given by the team leader, the data were entered by the data typists. Thereafter data were imported to a central database and subjected to a plausibility check with a set some of 350 rules. Plausibility rules were used to check outliers and inconsistency among the related questions. For example, marital status and young age, crop yields far above those in experiment stations or wage of unskilled labor far above

minimum wage were treated as violations. Lists of plausibility violations were compiled and sent to survey teams for re-checking in the paper questionnaires. Required changes were then implemented directly in the central database. For the second wave, plausibility checking rule with some 700 rules was incorporated directly into the data entry program to enable data entry operators and enumerators for immediate feedback. Due to the automated plausibility checking the number of violations is recorded for each household providing a proxy of measurement error as one type of the non-sampling errors analyzed in this study.

Box 2.1. Flowchart of data quality control of vulnerability survey
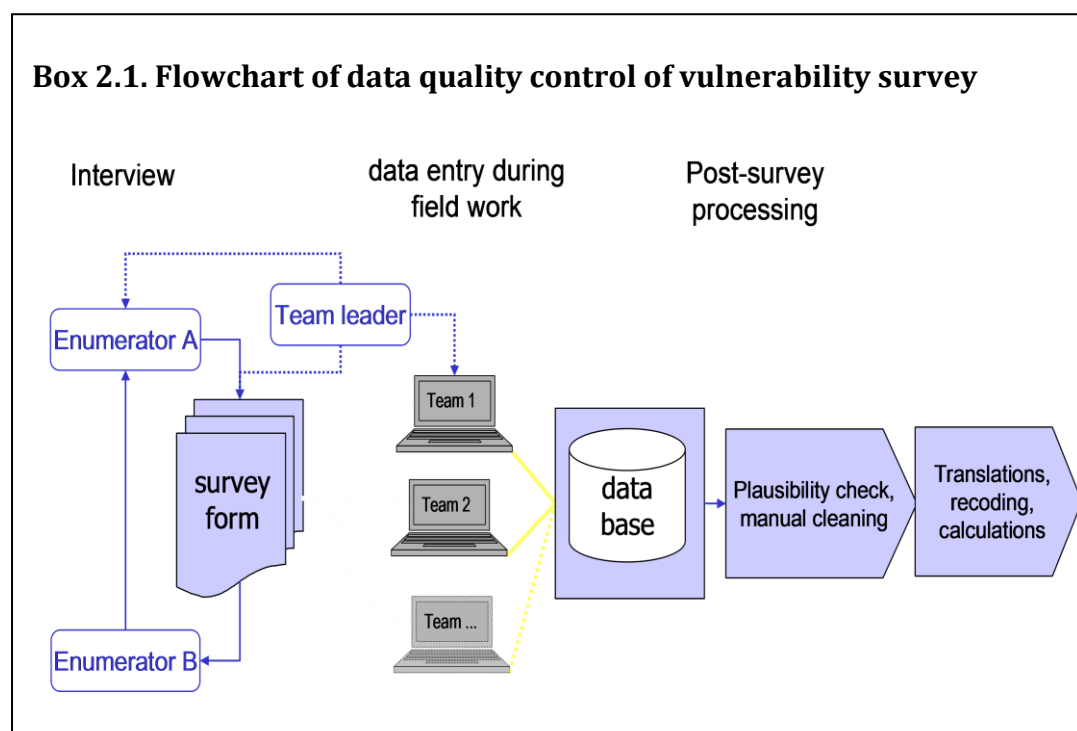
Source: DFG 756, subproject 2 (see http://www.vulnerability-asia.uni-hannover.de/bp_2.html)

2.3 Methodology

This chapter analyzes three types of the non- sampling errors, namely the coverage error, the non-response and the measurement error. It ignores the unit non-response rate as the overall rate of missing cases was less than 1% in both countries and in both waves.

The chapter analyzes the coverage error by making comparison with the basic statistics in both countries. It can be is expressed as a function of two components as shown in equation (1):

$$Y_c - Y = \frac{N_{nc}}{N}(Y_c - Y_{nc})$$

Where:

Y is statistical value of the full target population;

Y_c is statistical value of the population covered by the sampling frame

N is total number of the target population

N_{nc} is number of the target population not covered by the frame population;

Y_{nc} is the statistical of population not covered by the sampling frame

Since the coverage error is a function of both unknown components, (a) the proportion of the target population that is not covered by the frame and (b) the difference between the survey statistic of the population covered and those not covered, the total coverage error in a particular survey is unknown. However, it can be approximated by comparing key indicators between the sampling frame and the survey data.

It is important to recognize that there is often a time difference between data collection of the sampling frame and the survey. This difference increases with the number of waves of a longitudinal panel survey. Hence, the coverage of target population in the household survey could be reduced for example due to the movement among the household members or changes in household assets and production patterns. This is especially relevant in emerging market economy countries like Thailand and Vietnam. Therefore, this chapter evaluates the coverage error by comparing key indicators on provincial level that are available in both the sampling frame and survey. For Vietnam, it uses the age distribution of the population, household size, and agriculture land, the size of house and

percentage of household using electricity. For Thailand, it uses household size, percentage of population by age groups to evaluate the coverage error.

The item non-response and the measurement error are mainly the result of respondent or interviewer characteristics, questionnaire design as well as data entry and data analysis procedures. In this chapter, it concentrates on the impact of interviewer and respondent characteristics on these errors. Based on the literature there are four possible ways how interviewers could affect the non-sampling error. First, social psychologists view a survey interview as a structured social interaction (Kahn and Cannell, 1957). Therefore, the demographic and socio-economic characteristics of the interviewer can affect the behavior of respondents. Second, interviewers can implement the interview in different ways, i.e. deviate from the standard procedure. An enumerator, for example, can reword questions, may omit some (sensitive) questions, or make wrong recordings. Third, even if the interviewer follows the guidelines and reads questions out exactly as written in the questionnaire, intonation or emphasis for certain words can vary, possibly prompting altering answers of respondents. Fourth, interviewers may assist the respondents in finding answers to difficult questions, e.g. events which are difficult to remember by using different probing techniques. Marquis and Cannell (1969) showed that the major reasons that contribute to errors in recorded data are the failure to read a question exactly as printed, incorrect compliance with skips patterns, and reading a question too fast. Cannell et. al. (1977) and Schuman and Presser (1977) found that respondents with low education might be more easily affected by the behavior and status of the interviewers, i.e. they may seek help from the interviewer in answering difficult questions.

Another factor is interviewer anticipation of the respondent's answers. Hyman (1954) argued that interviewers have a prior distribution of expected answers on the questions and that this affects the way they conduct the interview e.g. by changing intonation and voice levels. Stevens and Bailar (1976) found that levels of missing data items were higher for interviewers who believed that it is inappropriate to ask respondents for their income.

Social norms related to gender issues for example can affect the interaction between interviewer and respondent. Nealon (1983) in a survey of farm women found that male interviewers obtained lower average reports of farm value, reports of more involvement in the work of farm and in farm organizations, and reports of greater satisfaction with farm programs than were obtained by female interviewers.

Interviewer experience is a factor that one would expect to be important for explaining variations in the non- sampling errors. Durbin and Stuart (1951), Lievesley (1986) and Couper and Grove (1992) find that interviewer experience is highly correlated with the response rate. Campanelli, Sturgis and Purdon (1997) analyzed the response rate in longitudinal surveys and found that interviewer continuity is important at earlier but less so in later survey waves. However, Booker and David (1952) found few differences in results by experience of the interviewer.

The socio-psychological literature concentrates on studying the influences on the communication of answers to survey questions. Failure of respondents to give accurate answers can be due to the characteristic of the respondent (age, education, knowledge). For example, Gergen and Back (1966) found that the elderly tend to give more "no opinion" answers to survey questions. Andrews and Herzog (1986) found that data from older respondents tend to provide somewhat less precise indication of the attitudes, behaviors, or other characteristics being measured than do the data from younger respondents. Krosnick et al, (2002) found that the respondents with low cognitive skills gave the much higher number of no-opinion answers compared to the higher education groups.

Motivation of respondent, length of recall time, and the complexity of questions are additional factors that can affect the quality of answers. Nisbett and Ross (1980) found there is a tendency to avoid burdensome, intensive thoughts about alternatives when forced to choose among them. The respondent's answer can also be affected by social desirability. While some attributes of individuals are negatively valued by societal norms (e.g. lewd behavior, poverty, criminal activity,

abuse of alcohol or drugs), others are positive values (honesty, voting in elections, church attendance). The characteristics of the interviewer, i.e. his ability to engage in a cognitive exchange, her manners and social behavior and the interview environment, i.e. the presence of other people during the interview can play a significant role for data quality.

A non-sampling error can also arise from proxy reporting, i.e. one household member will answer for all people on the household (proxy report). It is argued that, other things being equal, people will prefer to present a positive, highly valued description of themselves to others. Age and education of respondent are considered as the factors affecting the non-sampling error among both survey researchers and cognitive psychologists (Grove, 1989).

In the model to assess the causes of non-sampling error in this chapter, it takes the total number of item missing values in each interview (questionnaire) as the dependent variable. Items could be missing due to the failure to follow skip questions answers. In the questionnaire, there are the questions (close question) that contain the code "do not answer" and "don't know" answer. It counts the number of these answers for each questionnaire and treats them as another kind of item missing. The measurement error is accounted for by the number of violations with automated plausibility checking during data entry. Plausibility boundaries were defined based on assumptions for minimum and maximum values and internal logic that would warn data entry personnel of possible errors. These errors are counted by questionnaire and can be attributed to interviewer or respondent and household characteristics.

In this chapter, we established a model with a set of explanatory variables and two dependent variables: (a) the number of missing values and (b) the number of measurement errors. For (a) the data were pooled for both waves while for model (b) only the data of the second wave were used as no automated counts were established during the first wave.

A model to measure the impact of interviewer and respondent characteristics as well as interviewer environment on the above independent variables is applied as shown below:

$$Y_i = \alpha_0 + \beta_k X_{ki} + \delta_m Z_{mi} + \eta_n S_{ni} + \lambda_{ji} H_{ji} + \varepsilon_i$$

Where:

Y_i are the number of missing values or number of violations with plausibility checks of household i

X_{ki} are interviewer characteristics

Z_{mi} are respondent characteristics

S_{ni} are environment of the interview

H_{ji} are household characteristics

In order to account for the fact that both missing values and violations with plausibility checks could be errors of the data entry person instead of the enumerator we expanded the model to include a variable for team fixed effects T_j (team fixed effects model)

$$Y_i = \alpha_0 + \beta_k X_{ki} + \delta_m Z_{mi} + \eta_n S_{ni} + H_{ji} + T_j + \varepsilon_i$$

To test the validity of one the key variables in poverty and vulnerability studies we also investigated whether and to what extent a systematic influence exists between the above-specified set of independent variables and household consumption.

Item missing values and the measurement errors could affect the measurement of key indicator in the household survey and the estimation of the household welfare and poverty if they are not random distribution (correlated with key indicator).

A third model is defined to measure the impact of interviewer characteristics and interview environment on household consumption.

$$Y_i = \alpha_0 + \beta_k X_{ki} + \delta_m H_{ji} + \eta_n S_{ni} + \varepsilon_i$$

Where:

Y_i are the log of consumption of the surveyed household i

X_{ki} are the interviewer characteristics

H_{ji} are household characteristics that could explain the consumption of the household i

S_{ni} are the interview environments

The same modification as in the measurement error/missing value model is carried out to control for the effect of possible data entry errors by introducing a team dummy (T_j):

$$Y_i = \alpha_0 + \beta_k X_{ki} + \delta_m H_{ji} + \eta_n S_{ni} + T_j + \varepsilon_i$$

In the following, the results of the descriptive analysis comparing survey with sampling frame and the models for the non- sampling error variables defined above are presented.

2.4 Results

2.4.1 Sampling frame and sampling design

In this section, the results of some key indicators from the survey and the data used for sample selection are presented. Generally there is a good match between the two data sets except for one of the provinces (Ha Tinh) where our survey seems to under-represent the population under the age of 40 (see figure 2.1). This suggests that migration of younger people to urban centers is highly related to the fact that this province is among the poorest of the rural provinces in Vietnam.
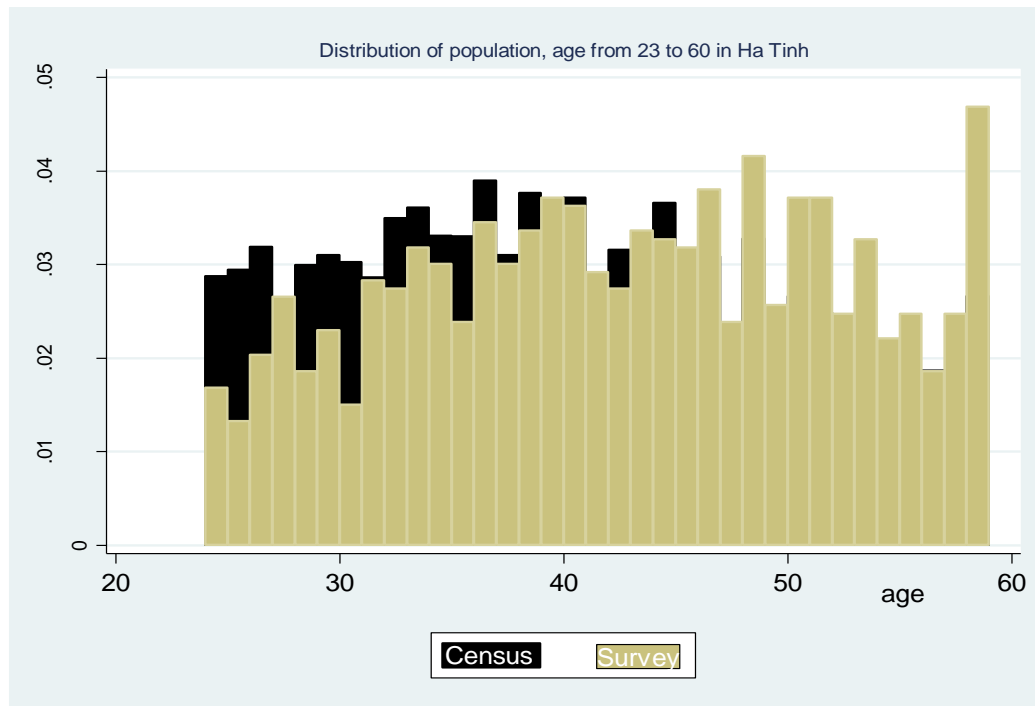
Figure 2. 1: Distribution of population by age (from 23 to 60) in Ha Tinh

Source: Author's calculation based on Agriculture Census 2006 and DFG's survey 2008

Using additional indicators like household size, total agriculture land, access to electricity and the size of the household's residence to test the representativeness of the survey in Vietnam shows considerable congruence for these parameters as none of the parameters shows any significant difference (see Table 2.1). However size of residence was found to be higher (although not significant) in the survey data, which is quite plausible considering the time difference between the two data sets and economic development in Vietnam.

Table 2. 1: Comparison of key indicators between Agricultural Census and Vulnerability Survey in Vietnam

	Agriculture Census 2006		Survey 2008	
	Mean	Std. Dev.	Mean	Std. Dev.
Ha Tinh				
Household size	3.85	1.64	3.87	1.55
Total Agriculture Land	0.44	1.18	0.44	0.50
% HH access to Electricity	0.99	0.07	0.99	0.07
Size of House	54.21	21.35	61.34	35.09
Hue				
Household size	4.58	1.97	4.41	1.86
Total Agriculture Land	0.43	1.31	0.65	0.85
% HH access to Electricity	0.98	0.15	0.98	0.13
Size of House	56.15	29.68	58.23	37.47
Dak Lak				
Household size	4.75	1.82	4.73	1.82
Total Agriculture Land	1.20	1.97	1.11	1.07
% HH access to Electricity	0.88	0.32	0.96	0.20
Size of House	53.70	30.98	59.73	38.71

Source: Authors calculation based on the Agriculture Census 2006 and DFG survey 2008

For Thailand, different indicators were used (Table 2.2). Generally, the difference between the two data sets is higher although not statistically significant. The larger gap in Thailand as compared to Vietnam is perhaps due the one year bigger time difference between the survey and the secondary data. This is especially noticeable for the age distribution of the population that is potentially in the labor force, i.e. 15 to 59 years. This could be a reflection of the more rapid rural urban migration in Thailand.

Table 2. 2: Comparison of key indicators between secondary data and vulnerability survey in Thailand

	Secondary data 2005		Survey 2008	
	Mean	Std. Dev.	Mean	Std. Dev.
Burirum				
Household size	4.21	1.68	3.99	1.71
Total HH members < 15 years old	0.96	0.98	1.08	1.01
Total HH members 15-59 years old	2.80	1.44	2.25	1.28
Total HH members >= 60 years old	0.45	0.70	0.67	0.81
Ubonrachathani				
Household size	4.16	1.70	4.05	1.79
Total HH members < 15 years old	1.00	0.98	1.02	0.99
Total HH members 15-59 years old	2.74	1.42	2.42	1.39
Total HH members >= 60 years old	0.42	0.68	0.61	0.78
Nakhon Panom				
Household size	4.06	1.73	3.89	1.60
Total HH members < 15 years old	0.93	0.96	1.08	1.02
Total HH members 15-59 years old	2.73	1.43	2.30	1.19
Total HH members >= 60 years old	0.39	0.65	0.52	0.73

Source: Author's calculation based on the Secondary data 2005 and DFG survey 2008

Based on the indicators chosen, it can conclude that the representativeness of the surveys was satisfactory. However, the problem could rise with the number of survey waves when the time gap to the secondary database becomes larger. In the case at hand, the problem is mainly related to migration issues. Hence the problems arising from the coverage error will affect conclusions about per capita consumption and income and therefore also conclusions with regards to vulnerability to poverty. One possible solution to this problem is to conduct a

complementary survey of those members of rural households who have migrated to urban centers[5].

2.4.2 Determinants of Non-sampling errors

Table 2.3 presents the descriptive statistics of the variables used in the non-sampling error models. It can be shown that the average number of missing values per household is about 10 times higher than the number of "no" answers or "don't know" answers per household. The number of plausibility check violations is about the half of the number of "no" answers or "don't know" answers. The average time spend for an interview is about 2 hours with a coefficient of variation of about 25%. Timing of interviews was quite even between morning and afternoon and only about 4% of interviews were conducted in the evening. As regards interviewer characteristics, most interviewers are young with an average age of 28 years and the gender ratio is almost even. Only 18% of the enumerators were natives from the province where the interview was conducted. Regarding respondent characteristics, it is noticeable that their age is about twice the enumerator age and the majority of respondents were household heads.

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[5] In 2010 the project carried out such a migrant survey in Bangkok and Ho Chi Minh City. Unfortunately the data are not yet available.

Table 2. 3: Summary statistics of variables used in the models to assess non- sampling errors

Variables	Obs	Mean	Std. Dev.
Dependent variables			
Total number of missing values per HH	8504.00	78.54	57.34
Total number of don't answers or "don't know" answers per HH	8504.00	7.11	10.00
Total number of violations with plausibility check	4268.00	3.18	3.07
Independent variables			
Interview duration (minute)	8429.00	126.70	35.35
Log of interview duration (minute)	8429.00	4.80	0.29
Interview in morning	8501.00	0.48	0.50
Interviewed in the afternoon	8501.00	0.47	0.50
Interview in the evening	8501.00	0.04	0.21
Interview in the harvested time (dummy)	8501.00	0.50	0.50
Sex of interviewer (1=male, 0=female)	8504.00	0.45	0.50
Age of interviewer (year)	8360.00	28.34	7.53
Square age of interviewer	8360.00	859.75	579.82
Local interviewers (1=yes, 0=no)	8504.00	0.18	0.39
Sex of respondent (1=male, 0=female)	8501.00	0.51	0.50
Ethnicity of respondent (Kinh & Thai =1, Others=0)	8501.00	0.86	0.34
Age of respondent (year)	8501.00	48.51	13.84
Square age of respondent	8501.00	2544.41	1428.92
Number of years in school of respondent (year)	8501.00	6.01	3.71
Square number of years in school of respondent	8501.00	49.92	57.57
Respondent is household head (1= yes, 0= otherwise)	8501.00	0.63	0.48
Number of household' labor (person)	8435.00	3.76	1.85
Agricultural land area (ha)	8420.00	1.67	2.59
Household size (person)	8501.00	4.97	1.95
First Wave (1=yes, no=0)	8504.00	0.50	0.50
Thailand (1=yes, 0=otherwise)	8504.00	0.49	0.50

Source: Authors calculations based on the DFG survey 2007 and 2008

Table 2.4 shows the results of the determinants of the non- sampling error. The first model is estimated for number of missing values in all sections of the questionnaire. The second model is estimated for number of missing values in all sections of the questionnaire, except the section asking about shocks and risks. This section contains the sensitive type of questions asking information about the household's past shock experience and their assessment of future risks. Asking about severe illness or death of household members can be difficult and sometimes superstitious[6] beliefs hinder asking about the respondent's expectation of negative events as some believe that talking about it could increase the likelihood for the event to actually take place[7]. Therefore, it needs to estimate the separate models (3) for this section to test whether the non-sampling error is affected differently in this most sensitive section compared to other sections. The determinant of the measurement error is estimated using both random and fixed effect (model 5 and model 6) and is presented in the appendix A.

The models to explain the non- sampling error shows an overall satisfactory statistical fit. Its coefficients generally have the expected signs. There are distinct factors that tend to increase and those than tend to decrease the non- sampling error. As expected, one of the outstanding factors that increase the non- sampling error is the duration of the interview. For an additional 1% increase in interview duration, the number of missing values and measurement error will increase by 15 and 1.2, respectively.

Similarly, the interview period is crucial also. Conducting a household survey in rural area often conflicts with the seasonality of agricultural production. Harvesting periods are peak labor seasons, which constrain respondents' availability and cash compensation for interviews may be below the opportunity cost of time. Interviews during harvesting period causes a trade-offs for the

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[6] Do & Phung (2010) shows that the year of birth is widely believed to determine success in Vietnam. They found that there is a sharp fertility response; years that are considered auspicious have significantly 12 percent larger cohorts

[7] One of the questions that had to be taken out after pre-testing the questionnaire was : "what is the chance that some one in your household will die in the next five years?"

interview team namely to conduct the interview in the evening or to interview elder household members who are no longer involved in field labor activities of the rural household. The model reflects these problems as shown by the significant negative coefficients for "evening interviews" and "harvest time".

Several variables of interviewer characteristics significantly affect the non-sampling errors. Interestingly, male interviewers cause less measurement errors and less missing values than female enumerators do. The number of missing values is significantly smaller for interviews conducted by male interviewer. One the other hand interviewer age significantly affects missing values but it does not affect measurement error. Young and old interviewers have higher number of missing values than the middle age interviewers.

Another remarkable result is that local interviewers significantly reduce the non-sampling error. Perhaps a better understanding of behavior, culture and customs facilitates interview environment and interaction between enumerator and respondent. The importance of interviewer-respondent interaction is also reflected in gender congruence. If interviewer and respondents are of the same sex it is easier to talk about culturally sensitive issues as shown by the significant coefficient for gender congruence in model 3 (which counts errors for the more sensitive questions).

Like for enumerators, gender also plays a role for respondents albeit with the opposite result. In the context of this survey in the two Asian countries when the respondent is a male, this leads to more the non- sampling errors. This result is true for all questions as well as for the sensitive ones. Ethnicity also plays a role for interview quality, as shown by the highly significant effect of the ethnicity variable. Belonging to an ethnic minority increases the error by 3.7 for the entire questionnaire and by 2.3 units for the sensitive questions. The ethnicity variable is significant for the sensitive questions, which indicates that asking sensitive questions is culture-specific. However, this could also be related to the fact that

in Vietnam local interpreter were used in interviewing ethnic minorities to translate the questions from Vietnamese[8] to local languages.

Young and old respondents have significantly less missing value and measurement error compared to the middle age respondent. The results in this study about the effect of respondent age do not support the findings of other literature however (e.g. Gergen and Back 1966).

The effect of respondent's education is also complex. We found that low education or high education respondent has less number of missing values but higher number of measurement error than respondents with an average level of education. It could reflect the situation that the low education has less knowledge to answer the difficult questions and the high education respondent does not want to answer the sensitive questions.

Another significant variable is household complexity as it found that the non-sampling error significantly increased with household size. An additional household member increased the number of the non- sampling errors by five for the entire questionnaire and by 0.2 for the sensitive questions..

In summary, the model to explain the non- sampling errors suggests that there are possibilities to reduce such errors when certain rules are observed that can be incorporated in the planning of the surveys. For example, it may be better to adjust the interview plan in such a way so that the household head will be available instead of interviewing any member of the household. Also, gender congruence is a variable that can be controlled by good interview planning. However, for sensitive questions, the special attention is needed for the interviews are conducted among ethnic minority households and the gender difference between interviewer and respondent.

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[8] In the Thai provinces only few households belonged to ethnic minorities

Table 2. 4: Determinant of non-sampling errors

	All sections	All sections, except section 3	Section 3 only
	Model 1	**Model 2**	**Model 3**
	Coef/se	Coef/se	Coef/se
Log of interview duration (minute)	15.040***	15.074***	-0.034
	(1.500)	(1.383)	(0.395)
Interview in morning (based is evening)	-8.331***	-5.383***	-2.948***
	(1.944)	(1.793)	(0.512)
Interviewed in the afternoon (based is evening)	-6.567***	-4.136**	-2.431***
	(1.945)	(1.794)	(0.512)
Interview in the harvested time (dummy)	3.569***	3.609***	-0.040
	(0.881)	(0.813)	(0.232)
Sex of interviewer (1=male, 0=female)	-4.560***	-2.697***	-1.863***
	(1.107)	(1.021)	(0.291)
Age of interviewer (year)	-2.052***	-1.288***	-0.765***
	(0.392)	(0.362)	(0.103)
Square age of interviewer	0.033***	0.024***	0.009***
	(0.005)	(0.005)	(0.001)
Local interviewers (1=yes, 0=no)	-3.446***	-2.785***	-0.661**
	(1.083)	(0.999)	(0.285)
Sex of respondent (1=male, 0=female)	2.037*	1.285	0.752**
	(1.177)	(1.086)	(0.310)
Ethnicity of respondent (Kinh & Thai =1)	-3.755***	-1.438	-2.317***
	(1.189)	(1.097)	(0.313)
Age of respondent (year)	0.809***	0.769***	0.040
	(0.179)	(0.165)	(0.047)
Square age of respondent	-0.008***	-0.008***	-0.001
	(0.002)	(0.002)	(0.000)
Respondent education (years in school)	1.417***	1.440***	-0.023
	(0.318)	(0.293)	(0.084)
Square respondent education	-0.078***	-0.074***	-0.005
	(0.020)	(0.018)	(0.005)
Respondent is household head (1= yes)	-3.704***	-3.191***	-0.514*
	(1.052)	(0.970)	(0.277)
Interviewer and respondent are same gender (1=yes)	-1.057	-0.027	-1.030***
	(1.508)	(1.391)	(0.397)

	All sections	All sections, except section 3	Section 3 only
	Model 1	**Model 2**	**Model 3**
	Coef/se	Coef/se	Coef/se
Number of household' labor	0.286	0.223	0.064
	(0.270)	(0.249)	(0.071)
Total agricultural land	0.001	0.002	-0.000
	(0.002)	(0.002)	(0.001)
Household size (person)	5.173***	5.042***	0.131**
	(0.251)	(0.232)	(0.066)
First Wave (1=yes, no=0)	-56.974***	-55.984***	-0.990***
	(0.862)	(0.795)	(0.227)
Thailand (1=yes, 0=otherwise)	-53.815***	-45.536***	-8.279***
	(1.002)	(0.924)	(0.264)
_cons	61.393***	30.355***	31.038***
	(11.040)	(10.183)	(2.906)
Number of observations	8,223	8,223	8,223
Adjusted R2	0.637	0.641	0.219

Note: *** p<0.01, ** p<0.05, * p<0.1, fixed effect models do not have much difference. Therefore, they are not presented

Source: Authors' Calculation based on DFG's survey 2007 & 2008

2.4.3 Impact on consumption of the household

In this section, the chapter examines the influence of the different variables used to explain the non- sampling error on key indicators relevant for vulnerability studies, namely household consumption. It hypothesizes that no correlation between interview environment and interview characteristics and consumption can be detected in order for the result of such surveys to be valid for vulnerability calculations.

To perform this analysis, the chapter conducts separate estimates for the two countries in order to better reflect the differences in socio-economic conditions. Table 2.5 presents the results of the model as specified in equation 5 in section 2.3. Overall, the statistical quality of both equations is satisfactory albeit with a better explanatory power of the equation for Vietnam.

Generally, the hypothesis can be confirmed as most variables for interview environment and interviewer characteristics are not significant in both countries. Most variables have the expected sign and for those significant ones causality can be consumption established. For example, all wealth related variables are positively related with consumption. In addition, provincial differences in per capita income are reflected in the respective dummy variables in both countries. There are a few exceptions though that deserves further discussion. For example, the variable "interviews conducted during harvested time" was highly significant in Vietnam suggesting that consumption estimates are about 9% higher.

In conclusion, the consumption model confirms the hypothesis that parameters essential for poverty and vulnerability analysis are randomly distributed and largely unaffected by those variables that were found to affect the non- sampling error. Hence, validity of the numerical values of the survey can be assumed.

Table 2. 5: Impact on household's consumption

	Thailand	Vietnam
	Coef/se	Coef/se
Interview in morning (dummy, based is evening)	-0.003	0.057
	(0.062)	(0.034)
Interviewed in the afternoon (dummy, based is evening)	-0.024	0.042
	(0.061)	(0.035)
Interview in the harvested time (dummy)	-0.032	0.087***
	(0.020)	(0.021)
Sex of interviewer (1=male, 0=female)	-0.004	-0.010
	(0.019)	(0.017)
Age of interviewer (year)	0.003	-0.001
	(0.004)	(0.001)
Local interviewers (1=yes, 0=no)	-0.009	na
	(0.019)	na
Production asset value of the HH (Vietnam=VND million, Thailand=1000 bath)	0.001***	0.007***
	(0.000)	(0.000)
Average number of years in school of adult household member	0.089***	0.040***
	(0.005)	(0.003)

	Thailand	Vietnam
	Coef/se	Coef/se
Household size	-0.062***	-0.079***
	(0.005)	(0.005)
Dependency ratio	-0.071	-0.244***
	(0.055)	(0.042)
Ethnicity of the HH (1= Kinh & Thai; 0=other)	0.027	0.477***
	(0.042)	(0.022)
Age of household head	0.006	0.009*
	(0.005)	(0.005)
Square age of household head	-0.000	-0.000
	(0.000)	(0.000)
Number of years in school of household head	0.009**	0.022***
	(0.004)	(0.003)
Sex of the household head (1=male, 0=female)	0.036	0.029
	(0.027)	(0.030)
Total agriculture land area owned by household	0.000*	-0.000
(hecta)	(0.000)	(0.001)
First Wave (1=yes, 0=no)	0.493***	-0.667***
	(0.020)	(0.021)
Ha Tinh province (1=yes, 0=no)		-0.468***
		(0.022)
Hue province (1=yes, 0=no)		-0.165***
		(0.020)
Buriram province (1=yes, 0=no)	-0.001	
	(0.030)	
Urbon province (1=yes, 0=no)	0.001	
	(0.030)	
_cons	6.508***	6.072***
	(0.187)	(0.130)
Number of observations	4,109	4,299
Adjusted R2	0.399	0.565

*Note: *** p<0.01, ** p<0.05, * p<0.1*

We estimates using team survey and village fixed effect and results do not difference.

Source: Authors' Calculation based on DFG's survey 2007 & 2008

2.5 Conclusions

Using the first two waves of the vulnerability survey conducted in Thailand and Vietnam in 2007 and 2008, this chapter examines the non- sampling error and the factors that affect this error and their impacts on the estimation of household's consumption.

The analysis has addressed three issues: 1) the difference between survey and sampling frame, 2) the influence of interview environment, as well as interviewer and respondent characteristics on the non- sampling errors and 3) the possible influence of these variables on household consumption as one of the key aggregates for vulnerability studies

For the first question, the comparison between survey and secondary data showed no statistically significant differences in key indicators used for sample selection. However, for indicators related to population structure in relation to rural urban migration such difference could become significant with further survey waves as the time difference between the two data sets widens. Thus, rural household surveys in emerging market economies require simultaneous survey of the migrants who belong to targeted rural households. Results of the analysis of the non- sampling errors (second question) show that there are indeed issues that need to be addressed in the management of complex household surveys who aim at the generation of data that will serve the purpose of vulnerability studies. Several variables related to interview environment, interviewer and respondent characteristics as well their interaction are significant. In particular, the length and timing of the interview with regards to time of the day and season (e.g. harvesting period of agricultural crops) significantly affect missing values and measurement errors. For interviewer characteristics, gender, age and the familiarity of the interviewer with the interview location are important variables. Likewise, respondent characteristics like age, sex, education, ethnicity and relationship with household head were found to be significant variables that affect non-sampling errors. Finally, the interaction between interviewer and respondent characteristics can play a role.

Proper survey organization and management can influence some of those variables such as gender congruence between interviewer and respondent.

The third question dealt with the hypothesis that variables that can affect the non- sampling errors will be uncorrelated with household consumption indicating the validity of the numerical data essential for vulnerability research. With the exception of the interview period in Vietnam, this hypothesis could be confirmed. Thus, there is reason to assume that the data in large-scale panel surveys are valid for the use in vulnerability research.

Chapter 3

Diversification in response to shocks among farmers in Vietnam[9]

3.1. Introduction

Poor households in developing countries generally face many uncertainties stemming from extreme weather conditions, market imperfections, and misguided policy regulations, in addition to the recent rapid liberalization and globalization process. Hence, income risk is generally high in developing countries, making rural households particularly vulnerable to covariate and idiosyncratic shocks (Dercon; 1999). The complete absence or only partial existence of formal insurance and credit markets (Besley, 1994) prompts households to adopt self- insurance mechanisms. In fact households living in high risk environments have developed rather sophisticated (ex-ante) risk-management and (ex-post) risk-coping strategies (Dercon; 1999).

Numerous studies have investigated diversification in developing countries. For example, Menon (2006) examined the effect of rainfall uncertainty on occupational selection in rural Nepal and found that occupational choice is mainly determined by the uncertainty associated with historical rainfall patterns, but this effect is less obvious in households that have access to credit. He

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[9] This chapter is a revised version of the paper: Phung, D.T, and H. Waibel (2009), "Diversification in land and labor allocation in response to shocks among small-scale farmers in central Vietnam" Schriften der Gesellschaft fur Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Bd.45, 2010:91-111.

suggested that improving access to credit markets for poor households might help reduce their vulnerability to rain shocks. Takasaki et al. (2002) examined the vulnerability and responses to covariate flood shocks and idiosyncratic health shocks among peasant households in the Amazonian tropical forests and found that households have four typical coping strategies, including alternative activities (gathering, fishing, and upland cropping), precautionary savings (food stock and asset disposition), labor adjustment, and informal insurance mechanisms (e.g., mutual insurance). Karugia et al. (2006) evaluated the role of land on income diversification and poverty reduction in rural Kenya and found that poorer households tend to depend more heavily on food-crop production and seasonal wage labor activities for their incomes and are therefore likely to be vulnerable in face of personal (such as illness) and covariate shocks such as droughts.

In Vietnam, Minot et al. (2006) used the three Vietnam Living Standard Surveys (1993, 1998 and 2002) to examine the trend of income diversification and poverty in the Northern Uplands of Vietnam. They found that income diversification including crop diversification, has increased in this region over time. Poorer households are more diversified in crop production than richer ones, and rural households are more diversified than urban. On the national level, crop diversification contributed about 12% of the growth of crop income with large variation among income groups. Non-farm income is becoming an important source of income of the household although it has grown only slowly during the 1998-2002 period. Using the Vietnam Living Standard Survey (1993 and 1998), Van de Walle et al. (2004) examined the role of the participation in the rural non-farm market economy on poverty and found that it will be the route out of poverty for some, but not all poor households. In addition, education, ethnic minority status and commune characteristics influence consumption growth and the level of diversification in the same way. However, some factors have opposite effects. The household size has positive impact on diversification but negative on welfare while land size has positive impact on the welfare but negative on diversification.

Most current papers have analyzed income diversification in the context of economic growth and poverty. However, these analyses did not always adequately capture the dynamic nature of poverty. For example, the role of past environmental and economic shocks in explaining diversification has often been ignored in the literature as the analysis requires time- series data of shock events. In addition, most of recent papers focused mainly on the income diversification that measured by share of non-farm income and number of income sources (Lanjouw et al. 2001; Ersado 2006). However, income diversification is in fact the result of household portfolio diversification. Therefore, this chapter uses different approach to explore the diversification of the household resource (mainly land and labor) as one of the self- insurance mechanisms for risk- management and shock coping strategies for the case rural households in three provinces in Central Vietnam, namely Ha Tinh, Hue and Dak Lak. Where the formal of agriculture insurance system is inexistence and the credit markets are incompletion. The data used for this analysis come from the first phase of a panel household survey carried out under the auspices of the DFG research project "Impact of Shocks on the Vulnerability to Poverty: Consequences for Development of Emerging Southeast Asian Economies." A total of 2200 households were interviewed on their socio-economic status, health, education, income, consumption, assets, borrowing and the shocks that they experienced during the past five years. A simple model is developed that uses different diversification parameters to investigate the effect of commune and household characteristics as well as those of past shocks and anticipated risks on the diversification of labor and land resources of rural households.

The chapter is organized as follows. In the next section, a brief assessment of the types of risks that recently occurred in Vietnam is presented. This can help to set the frame for specifying the role of shocks that were observed from the survey. Section 3.3 provides the methodology for measuring diversification. Section 3.4 presents the data and the model specification and Section 3.5 presents the empirical results. The last section is the summary and conclusion.

3.2. Agricultural Risks in Vietnam

To a large extent, rural households in Vietnam depend on agriculture as the main source of income. However, income from agriculture tends to be unstable for two major reasons. First, the increasing environmental risks, and second, the economic risks incurred with Vietnam's rapid development and integration into world economy. Natural disasters such as typhoons, storm surges, flash floods, drought, and saline water intrusion are increasing. In 2007, more than 400 people were killed by natural disasters; 6936 houses and 975 schools were destroyed. The total economic value of losses was estimated at USD 704 million (XHMT- GSO 2007). Natural disasters affect particularly the central coast region where typhoons, storm surges, flash floods, drought, and saline water intrusion often happened during the year. Drought is often recorded in Central Highlands, while floods, typhoons, and storms are very frequent in North Central Coast (Chaudhry and Ruysschaert 2007). Livestock diseases such as avian flu and foot and mouth disease are also increasingly affecting Vietnam in recent years. Rural households are mostly affected by these risks with strong implications for the economy considering that the agricultural sector accounts for almost half of total household income and absorbs 64% of the labor force in Vietnam (VHLSS 2006). The likelihood of disasters is also increasing as a result of global warming. A recent study by Dasgupta et al. (2009) on the potential impacts of sea level rise in 84 coastal developing countries showed that a 1-meter rise in sea level would have an effect on approximately 5 percent of Viet Nam's land area, affect 11 percent of the population, impact 7 percent of agricultural land, and could reduce GDP by 10 percent.

The economic risks for agriculture and rural areas are a result of Vietnam's open economy policy. The process of liberalization and rapid integration into the world economy with reducing trade protection and subsidies exposes the domestic markets to fluctuations of the international markets. A good example is the commitment to abolishment of quota for all imported products, and import tax for agriculture products are reduced after becoming a member of WTO such as beef from 20% to 14%, for pork from 30% to 15% in 2006. In addition, the

high inflation in 2008 (23%) and job losses and less job creation in 2009[10] are clear evidences of the impact of global crisis on the Vietnam economy.

3.3. Methodology to measure diversification

In developing countries, rural households often depend on a few sources of income (Reardon 2007; Toulmin et al. 2000). Ersado (2006) summaries key factors, found in the papers of other authors that can explain the income diversification strategy that a household can choose. These include: (a) self-insurance against risk in the context of missing insurance and credit markets, (b) an ex-post coping strategies, (c) an inability to specialize due to incomplete input markets, (d) a way of diversifying consumption in areas with incomplete output markets, (e) to exploit strategic complementarities and positive interactions between activities, and (f) simple aggregation effects where the returns to assets vary by individual or across time and space. In the absence of good formal insurance and credit markets, agricultural households in Vietnam have basically two options to reduce income variability. The first option refers to land allocation decisions and the second refers to labor allocation decisions.

On land, households may select an agricultural enterprise where the correlation between price and yield is low or adjust the crop portfolio to the specific characteristics of their land, i.e., growing different crops on different parcels of land in order to minimize the effect of biotic or a biotic stresses. The second option is for households to reallocate their labor into non-farm activities as wage income is largely uncorrelated with agricultural income. In addition, non-farm income can help to accumulate assets in a good agricultural year, which increases the household's capacity to smooth consumption in the years with shocks affecting agriculture.

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[10] According to the Ministry of Labor, Invalids and Social Affairs (MOLISA) (Thanh and Quynh, 2009), as of January 23, 2009, about 67 thousand laborers working in enterprises have lost their job due to the global economic downturn. Nguyen, Pham (2009) estimated job creation in 2009 and found that it is only about 70% of 2008 and unemployment rate will be 5.2% compared to 2.5% in 2008.

The actual degree of diversification chosen by a household depends on several factors. First is the initial conditions, i.e., how strongly its income varies and what its capacity to smooth consumption is. Second is the household's preference towards risk and third is the cost of diversification, i.e., the amount of income reduction for reducing risk. Risk-averse households will tend to diversify more and will accept higher risk premiums. For example, Morduch (1990) found that credit-constrained households are more willing to sacrifice income in order to reduce risk. In order to better understand income diversification strategies actual portfolio diversification needs to be analyzed, as the share of each income source in total income depends on the allocation of household resources for each income generating activity, including liquid capital, assets and labor allocation (e.g., Barrett 2000; Minot 2006).

Culas et al. (2005) and Minot et al. (2006) discuss different methods that can be applied to measure diversification. Culas et al. used four indices to measure diversification. The first index is called *the Index of maximum proportion (M1),* defined as the ratio (proportion) of the farm's primary activity to its total activities. It is measured as the maximum proportion of the crop acreage in activity *i* in total farm acreage cropped so the diversification increases when *M1* decreases. This index has limitations, as it does not take into account the balance in planting area among the other crops as well as the total number of crops grown. With the same value of *M1,* households having more crops or better balance among the rest of crops (excluding the biggest proportion of planting area crop) could have more diversification than other households. The second index is the number of activities *(M2)* that the farm operates. As pointed out by the author, the weakness of this index is that it gives no weight to the distribution of the farm's employment over the activities. The third index is the *Herfindahl index (M3),* calculated as the sum of squares of the shares of a farm's activities. The *Herfindahl index* gives heavy weight to the farm's principal activities. As it gives limited weight to minor activities, this index is insensitive to minor activities. The fourth index is the *entropy index (M4)*. This index gives less weight to the larger activities by multiplying the share of activity *i* by a log term of the inverse of the respective shares. However, both *M3* and *M4* cannot be

applied for cases where household incurs negative income from their income generating activities. Therefore, these indices could not be used for estimating income diversification. Minot et al. used *M2*, the *share of non-farm income in total income,* and another ways of the *M3* and *M4* to measure income diversification that are the Simpson Index of Diversity (SID) and the Shannon-Weaver index (SW).

The SID index is defined as:

$$SID = 1 - \sum_i P_i^2$$

where P_i is the proportion of household portfolio that is allocated to income generating activity *i*. The index takes into account the number of income generating activities, the share of household resources allocated to each activity and gives more weight to the activity with a higher share of household portfolio allocation. The index ranges from 0 to 1 with 0 if a household devotes all resources to one income generating activity and approaching 1 if the number of income generating activities is very high.

The SW index is defined as:

$$SW = - \sum_i P_i Ln(P_i)$$

where P_i is defined as the same as in the SID index. Like the *M4,* the *SW* index gives less weight to the dominant of the household income activities.

In this chapter, the SID and the SW indexes are applied taking into account the resource capacity of the household. The SID and the SW indexes for labor allocation were based on the main occupations of the household members aged from 10 to 60. Therefore, P_i is the proportion of the household labor devoted to each of main three main occupations that were classified as agriculture, wage employment, and non-farm self-employment.

The SID index and the SW index for land area was based on the area that households allocated to each crop during the crop year 2006/07 then P_i is the share of the total agriculture land that household allocated to crop i. About 30 different crops were included in the crop diversification index.

Like the *Herfindahl and entropy indexes,* the SID and the SW indexes in principle can also be used for measuring income diversification. The problem is the occurrence of negative net income. Therefore, the total number of income sources and the number of crops grown were used as additional measures of diversity *(M2)*. Income sources were specified by major sources, namely income from crops and forestry, income from livestock and aquaculture including hunting, income from non-farm self-employment, income from wage employment, income from public transfer, income from dividend and capital gain, income from remittances, and other income such as income from indemnity

3.4. Data and Model Specification

3.4.1. Data

We use data from the first phase of a survey of three provinces in Central Vietnam conducted for the project "Impact of Shocks on the Vulnerability to Poverty: Consequences for Development Emerging Southeast Asian Economies." This survey was conducted in Dak Lak, Hue, and Ha Tinh provinces from June to August 2007. 2200 households were randomly selected for interview from 220 villages in 110 communes in all districts of these provinces. The sample was distributed proportionately to the population size of each district with some adjustments to over-sampling in the remote areas where the population is small and thus the number of households would have been insufficient for the estimation.[11] Hence, a weighting procedure was used to adjust for over-sampling in remote areas. Two questionnaires were used in this survey, one for the household and the other for the village. The household questionnaire collects information about various aspects of the socio-economic conditions of the

[11] Detail information about sample design of this survey is discussed in "Sampling for vulnerability to poverty: Cost effectiveness versus precision". Bernd Hardeweg, Suwanna Praneetvatakul, Tung Phung Duc and Hermann Waibel

household. It includes demographic conditions, migration, education, health, agriculture, off-farm and non-farm employment, borrowing and lending, remittance, insurance, consumption and assets. In addition, there is a special section that collects information about the different types of shocks that the household has experienced since 2002 and the different types of future risks that the household perceived. It includes the common (flood, drought, storm, avian flu,) and the idiosyncratic (sickness, death, accident, job loss, bankruptcy) shocks and risks. For each type of shock and risk, the respondent was asked to evaluate the impacts on the household as well as the coping strategies that household used to cope with the shock. The village questionnaire is used to interview village leaders to collect information about infrastructure and basic public goods (such as access to the market, road, and irrigation systems) that could affect the livelihoods of the households (questionnaires are posted on http://www.vulnerability-asia.uni-hannover.de/390.html).

3.4.2. Model Specification

A simple linear regression model was used to measure the effect of shock and risk on the portfolio and income diversification of the household.

(1) $$Y_{ij} = \beta_0 + \sum_{k=1}^{K}\beta_k X_{ijk} + \sum_{n}^{N}\gamma_n S_{ijn} + \sum_{m}^{M}\varphi_m R_{ijm} + \varepsilon_{ij}$$

Where:

Y_{ij} are the SID and the SW indexes of labor, land of the household i in village j, the number of income sources, the number of crops grown of the household i in village j.

X_{ijk} are control variables for factors that are believed to influence the diversification decision of a household. These include household and village characteristics. The age of the household head is a proxy of the indicator reflecting the working experience that is added on the model to control the impact of this variable on the diversification. Education could have positive impacts on the diversification of both labor and land of the household as

higher education gives better opportunities to work in the non-farm sector that requires skilled labor. In addition, household heads with higher education are expected to manage and allocate their resources better than the household head with lower education. The sex of the household head might also effect on diversification so this variable is included in the model.

An important control variable is the total assets lost due to shocks, which could reduce the chance of household to recover production with a possible negative impact on the diversification of the household. Access to credit could help the household expand its production and move labor working in agriculture into other sectors. Therefore, it could have a positive effect on the diversification of the household. However, access to credit could help the household to specialize rather than diversify on the crop production when household was hit by shocks as it reduces the vulnerability of the household. Therefore, it could have the negative impact of the interaction variable between number of shocks and access to credit on the number of crops grown and the land allocation of the household. We expect the negative sign for total assets for production on the diversification of land but positive sign on the labor. Households with more assets for production could have a better chances to specialize their land on the high return crops and have more chance to move their labor in non- farm income generating activities. Labor is an important input of production so households with more labor (measured as the number of people aged from 10 to 60) could have better chances to diversify in agricultural production as well as in non-farm activities, thus this variable could have positive impacts on the dependent variable. In Vietnam, there is a big difference between Kinh & Chinese ethnic group with the ethnic minority group in terms of economic status and in culture. Therefore, an ethnic minority variable is added in the model. In order to grow more crops, the household needs more land. Hence, the total owned agricultural land area could have positive effect on land diversification and the number of crops grown by household but it could have an opposite effect on labor diversification as it absorbs more labor to work in agriculture. In Vietnam, agriculture land is very fragmentation, especially in the North and Central. In average, each rural household has about 6.5 plots. These numbers in North Central Coast and Central

Highlands are in turn 5.8 and 3.9 (VHLSS 2004). Land fragmentation could reduce the chances to specialize on the crop production of the household as it increases the cost of transportation, travel time and reduces the economy of scale. Therefore, the number of agricultural land plots is added on the model to control this impact. The Land Use Certificate (LUC) reflects the ownership status of the household on the land so the household could invest more on the LUC plots. In addition, the irrigated land could allow the household to specialize on high value crops. Therefore, these factors could favor specialization.

People living in the mountainous area or far away from the urban area generally have a lower chance to work on the non-farm activities due to lack of information and high transaction costs, such as transportation. Thus, we expect a negative effect on labor diversification. On the other hand, this could have positive effect on the land and crop diversification due to high transaction costs for buying and selling the products. The dummy variables to control the difference in diversification among three provinces are added on the model.

In the section 3.1 of the survey, the households were asked to provide the shocks that were happened in the past 5 years and then to evaluate the impact of each shock on their living with four levels (high, medium, low, and no impact). We define the shock as it has at least medium impact on the well-being of the households. In addition, we include in our models only the shocks that could have potential impact on the diversification. These shocks are Agriculture shocks (Flooding of agricultural land; Drought; Unusually heavy Rainfall; Crop pests; Storage pests; Livestock Disease; Landslide; Erosion; Storm) and Economics shocks (Collapse of business; Unable to pay back loan; Strong increase of interest rate on loans; Strong decrease of prices for Output; Strong increase of prices for Input; Change in market regulations). We excluded the Social and Demographic Shocks that are no impact on the diversification decision of the households. Therefore, S_{ijn} are only included the agriculture and economics shocks.

We define S_{ijn} as a dummy variable for the number of the shocks of the household i in village j. Therefore, S_{ijn} is defined as bellow:

No of shocks of the household i	S_1	S_2	S_3
0	0	0	0
1	1	0	0
2	0	1	0
3 or more	0	0	1

R_{ijm} is defined as a risk variable. In the household survey, respondents were asked to assess the likelihood of different types of events that they expected would take place in the next 5 years and the impacts of these events on the household. The definition of events on this subsection is the same as in the shock section. Therefore, the R_{ijm} variable has the same variable labels as the S_{ijn} variable except that R_{ijm} reflects the risk management strategy of the household while S_{ijn} refers to the risk coping strategy.

The descriptive statistics of the dependent and independent variables are shown in the Table 3.2 in section 3.5.

It is reasonable to assume that village characteristics might simultaneously correlate with both diversification and shock. Households living in the same village are often affected by common shocks such as natural disasters, crop and livestock diseases and they also have the same production pattern, especially in agriculture production. This interdependence could impair the identification of the estimation of equation (1). To control these factors and the unobserved external variables, a village fixed effects model was formulated and these factors and unobserved external variables are captured by fixed effects V_j :

(2) $$Y_{ij} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{ijk} + \sum_{n}^{N} \gamma_n S_{ijn} + \sum_{m}^{M} \varphi_m R_{ijm} + V_j + \varepsilon_{ij}$$

3.5. Results

Table B and C in the appendices show the distribution of different shocks among three provinces during the past 5 years. Illness of the household, drought, floods, livestock diseases and unusual heavy rainfall are the major shocks that happened in these provinces. However, drought is most popular in Dak Lak while floods

usually occur in Ha Tinh and Hue. Hue has a much higher percentage of households affected by unusual heavy rainfall while Ha Tinh has a higher percentage of households affected by livestock diseases. Table 3.1 shows some key indicators of the three provinces. Ha Tinh is the poorest province measured by the percentage of poor households and the income per capita while Dak Lak is the richest province. In addition, households living in Dak Lak have about 43% of income from crops while households in Hue and Ha Tinh are less dependent on the income from crops.

Table 3. 1: Summary statistics of key indicators of the three provinces

Indicators	Ha Tinh	Hue	Dak Lak
Poor households (%)	48.0	30.7	28.9
Income from crop production (thousand VND)	3155.7	3361.4	14077.1
Total income of the household (thousand VND)	19136.5	23862.2	32990.3
Income per capita per month (thousand VND)	443.9	488.5	678.8
Share of income from crop (%)	16.5	14.1	42.7

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

Table 3.2 shows the summary statistics of all variables. 60% of the households reported at least one shock in the past five years and there is about 3% of the households have at least 3 shocks in the past 5 years. In terms of shocks expected in the future an even higher proportion of the respondents (86%) expected at least one event to take place in the next 5 years and there are about a half of respondents think that at least 3 risks will be happened in the next 5 years.

Table 3.2 also shows the variables for diversification. On average, each household has about 4 income sources and 2.2 crops grown. It reflects the specialization in agriculture production in these provinces, especially in Dak Lak where coffee production is dominant. The results of SID and SW land indices (0.27 and 0.46, respectively), SID, and SW labor indices (0.35 and 0.53, respectively) also show the low level of diversification of the rural households in these provinces.

Table 3. 2: Summary statistics of variables

Variables	Obs	Mean	Std. Err.	Min	Max
Dependent variables					
Number of income sources	2195	3.92	1.07	1.00	8.00
Number of crops grown	1976	2.22	1.28	1.00	8.00
SID land index	1976	0.27	0.25	0.00	1.00
SW land index	1976	0.46	0.44	0.00	1.77
SID labor index	2183	0.35	0.24	0.00	0.80
SW labor index	2183	0.53	0.38	0.00	1.75
Independent variables					
Household characteristics					
HH has experienced with one shock in the past 5 years (1=yes, 0=no)	2195	0.41	0.49	0.00	1.00
HH has experienced with two shocks in the past 5 years (1=yes, 0=no)	2195	0.16	0.37	0.00	1.00
HH has experienced at least 3 shocks in the past 5 years (1=yes, 0=no)	2195	0.03	0.18	0.00	1.00
HH expected one risk in the next 5 years (1=yes, 0=no)	2195	0.15	0.35	0.00	1.00
HH expected two risks in the next 5 years (1=yes, 0=no)	2195	0.21	0.40	0.00	1.00
HH expected at least 3 risks in the next 5 years (1=yes, 0=no)	2195	0.50	0.50	0.00	1.00
Total asset lost due to shocks in the past 5 years (VND million)	2195	4.17	10.69	0.00	220.00
Household is currently borrowing (1=yes, 0=no)	2195	0.72	0.45	0.00	1.00
Interaction between shock and current borrowing	2195	0.66	0.47	0.00	1.00
Total asset value for production of the household (VND million)	2195	7.34	19.27	0.00	518.41
Total asset value for crop production of the household (VND million)	2195	6.81	18.08	0.00	518.41
Total household member aged from 10 to 60	2195	3.68	1.91	0.00	11.00
Ethnicity of the household (1= Kinh & Hoa, 0=other)	2195	0.79	0.41	0.00	1.00
Age of the household head	2192	47.94	13.86	17.00	99.00
Square age of the household head	2192	2490.37	1465.98	289.00	9801.00
Number of years in school of the household head	2195	6.63	4.02	0.00	20.00
Sex of the household head (1=male, 0=female)	2195	0.84	0.36	0.00	1.00
Total land area owned by household (hectare)	2195	0.79	1.73	0.00	40.76

Variables	Obs	Mean	Std. Err.	Min	Max
Share of the household land area having Land Use Certificate (LUC)	2158	0.64	0.45	0.00	1.00
Share of the irrigated land of the household	2195	0.46	0.45	0.00	1.00
Number of Agriculture land plots	2184	3.42	1.71	1.00	12.00
Village characteristics					
% HH in village has migrated person	2195	35.87	19.70	0.00	7.00
Distance from village to District town (km)	2175	13.64	10.32	0.20	75.00
Village is located in the mountain (1=yes, 0=no)	2175	0.47	0.50	0.00	1.00
Ha Tinh province (1=yes, 0=no)	2195	0.33	0.47	0.00	1.00
Hue province (1=yes, 0=no)	2195	0.33	0.47	0.00	1.00
Dak Lak province (1=yes, 0=no)	2195	0.34	0.48	0.00	1.00

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

3.5.1 Diversification of labor allocation

To investigate the effects of shocks, two different models were used with and without fixed- effects to measure impacts of shocks on labor diversification measured by SID and SW indices. The shock variables were included as dummy variables. Results of all models are shown in table 3.3. It shows that rural households in Vietnam do not use labor diversification as ex- post coping strategy. There is no significant difference among the households experienced with different number of covariate shocks. The result is consistent with both diversification measurements. The households with higher expectation of covariate risks have higher level of labor diversification. However, it is only significant difference for the household that they expected at least three risks happened in the next five years. It reflects that the diversification in labor occurrs only in the high risk-adverse households and only these households use labor diversification as the (ex-ante) risk management. In addition, it is also reflected the socio- economic situation of the country where the non-farm job opportunity is scare, especially for the unskilled person who want to move from agriculture sector in to other sectors.

Smooth consumption during the time of shock could reduce the vulnerability of the household to poverty and increase the level of labor diversification. The

result shows household access to credit during the shock time has strongly positive, significant higher the level of labor diversification and the coefficient is consistent among the models. As expectation, the level of labor diversification is obviously dependent on the number of labors in the household. The household with more labors will allocate some of them into non- agricultural sectors to maximize the production efficiency. The household with young or old household head tend to diversify less than the household with middle-age household head. However, age of household head is only significant in fixed effect model. In addition, the impact of education of the household head, measured by number of years in school, is positive significant on the level of diversification. The impact of land holding on labor diversification is only significant in the random effect models. Land Use Certificate (LUC) is considered the most important factor that pushed the booming in agriculture production in Vietnam since 1990. It gave farmers the power to exchange, transfer, lease, inherit and mortgage their land use right. Therefore, it increases the agriculture investment. We saw that the household with higher share of LUC tends to less diversify their labor than other households. However, the land fragmentation and irrigration have positive and strongly significant impact on the labor diversification. As expected, the percentage of migration people in the village is the pushed factors on the labor diversification. Location of the household is very important factor for the movement of the labor out of agriculture sector. The omission of village variables in the fixed effects model reduced the overall fit of the model suggesting that location factors are an important determinant of labor diversification.

Table 3. 3: Determinant of SID and SW labor indices

Independent variables	Dependent variable			
	SID		SW	
	(1)	(2)	(3)	(4)
HH has experienced one shock in the past 5 years (1=yes, 0=no)	-0.003	0.014	-0.013	0.015
	(0.013)	(0.014)	(0.021)	(0.022)
HH has experienced two shocks in the past 5 years (1=yes, 0=no)	-0.018	0.019	-0.032	0.026
	(0.018)	(0.020)	(0.029)	(0.031)
HH has experienced at least 3 shocks in the past 5 years (1=yes, 0=no)	-0.028	-0.022	-0.057	-0.044
	(0.033)	(0.035)	(0.052)	(0.056)
HH expected one risk in the next 5 years (1=yes, 0=no)	0.018	0.013	0.030	0.023
	(0.020)	(0.019)	(0.030)	(0.030)
HH expected two risks in the next 5 years (1=yes, 0=no)	0.024	0.023	0.041	0.040
	(0.019)	(0.019)	(0.029)	(0.030)
HH expected at least 3 risks in the next 5 years (1=yes, 0=no)	0.033*	0.029*	0.047*	0.041
	(0.017)	(0.017)	(0.026)	(0.027)
Total asset lost due to shocks in the past 5 years (VND million)	-0.001	-0.000	-0.001	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)
Household is currently borrowing (1=yes, 0=no)	-0.034*	-0.032	-0.060**	-0.059*
	(0.019)	(0.019)	(0.030)	(0.031)
Interaction between shock and borrowing	0.063***	0.059***	0.106***	0.105***
	(0.019)	(0.019)	(0.030)	(0.031)
Total asset value of HH for production (VND million)	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Total household member aged from 10 to 60	0.026***	0.023***	0.046***	0.042***
	(0.004)	(0.003)	(0.006)	(0.006)
Ethnicity of the household (1= Kinh & Hoa, 0=other)	0.016	-0.006	0.036	-0.004
	(0.018)	(0.036)	(0.028)	(0.056)
Age of the household head	0.003	0.005*	0.005	0.009*
	(0.003)	(0.003)	(0.005)	(0.005)
Square age of the household head	-0.000	-0.000**	-0.000	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Number of years in school of the household head	0.002	0.005***	0.003	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Sex of the household head (1=male, 0=female)	-0.011	-0.016	-0.020	-0.027
	(0.016)	(0.015)	(0.025)	(0.024)
Total agriculture land area owned by household	-0.007*	-0.004	-0.012*	-0.007

Independent variables	Dependent variable			
	SID		SW	
	(1)	(2)	(3)	(4)
(hectare)	(0.004)	(0.003)	(0.006)	(0.004)
Share of the agriculture land area having Land Use	-0.019	-0.028**	-0.030	-0.043**
Certificate (LUC)	(0.012)	(0.014)	(0.019)	(0.022)
Share of the irrigated agriculture land of the	0.040***	0.044***	0.062***	0.071***
household	(0.012)	(0.015)	(0.019)	(0.024)
Number of agriculture land plots owned by	0.010***	-0.001	0.018***	-0.000
household	(0.003)	(0.004)	(0.006)	(0.006)
Percentage of household in village has migrated	0.001**		0.001***	
person (%)	(0.000)		(0.000)	
Distance from village to District town (km)	-0.001**		-0.002*	
	(0.001)		(0.001)	
Number of observations	2,091	2,091	2,091	2,091
Village fixed effect	no	yes	no	yes
Adjusted R2	0.1014	0.0791	0.1132	0.0885

Note: Constant not reported. Robust standard errors in parentheses. Cluster at commune level

*The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively.*

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

3.5.2 Diversification of land

Land diversification is mainly related to agriculture and economic shocks. It can be assumed that the correlation in terms of income variability among the crops is imperfect positive. Different types of shocks could impact on the different types of crops. Therefore, households might allocate agricultural land to different crops and balancing of land allocation for each crop to manage the risk in agricultural production. Table 3.4 shows that shocks have a positive impact on the land allocation among the crops of the household. The level of impact is also higher for the household with higher number of experienced with shocks and the results are consistence among models. Risks also have a positive effect on the land diversification. The results confirm that the rural households in Vietnam use

land diversification as ex-port and ex-ante risk coping and risk management strategies.

The household experienced with shock and accessed to credit is less vulnerable than the household without credit access. We see that the interaction between borrowing and shock has negative sign impact on land diversification but it is not significant. The age of the household head shows a non-linear correlation with land diversification. The possible reason is that households could grow more kinds of crops as well as balance the planted area among crops in the first half of their working life due to lack of experience and then gradually concentrate on the crops that give high yield values when the working experience is increasing in the second half of their working life. Education of the household head has positive significant impact on the land diversification of the household while the male-headed household has less diversify in land than female-headed household. Household with more land can have better chance to specialize on the high yield crop value as it could use land as collateral for access to credit and more land could give motivation for higher investment because it could reduce of production cost due to economy of scale. As result, total agriculture owned land area has negative significant impact on the land diversification in the random effect models. The irrigated land allows the household to specialize their crop production and then reduce the balancing of land allocation but number of agriculture land plots has opposite impact. This result gives some policy implications for government to invest more on the irrigation system and as well as to speech up the land reconsolidation program that is implementing at the moment. This finding is consistent with the finding of Minot et al (2006) and Pandey et al (2006) for the households in Northern Upland of Vietnam.

Table 3. 4: Determinant of SID and SW land indices

Independent variables	Dependent variable			
	SID		SW	
	(1)	(2)	(3)	(4)
HH has experienced one shock in the past 5 years (1=yes, 0=no)	0.026**	0.010	0.039*	0.020
	(0.013)	(0.012)	(0.022)	(0.020)
HH has experienced two shocks in the past 5 years (1=yes, 0=no)	0.072***	0.021	0.116***	0.047*
	(0.018)	(0.016)	(0.031)	(0.027)
HH has experienced at least 3 shocks in the past 5 years (1=yes, 0=no)	0.107***	0.071**	0.175***	0.129***
	(0.033)	(0.028)	(0.056)	(0.048)
HH expected one risk in the next 5 years (1=yes, 0=no)	0.046**	0.026	0.060*	0.023
	(0.019)	(0.017)	(0.031)	(0.029)
HH expected two risks in the next 5 years (1=yes, 0=no)	0.048***	0.045***	0.076***	0.066**
	(0.017)	(0.016)	(0.029)	(0.027)
HH expected at least 3 risks in the next 5 years (1=yes, 0=no)	0.039**	0.027*	0.062**	0.034
	(0.015)	(0.015)	(0.026)	(0.025)
Total asset lost due to shocks in the past 5 years (VND million)	-0.000	-0.001	-0.000	-0.001
	(0.001)	(0.000)	(0.001)	(0.001)
Household is currently borrowing (1=yes, 0=no)	0.045**	0.017	0.068**	0.014
	(0.019)	(0.017)	(0.032)	(0.028)
Interaction between shock and borrowing	-0.026	-0.016	-0.037	-0.011
	(0.019)	(0.017)	(0.032)	(0.028)
Total asset value of HH for production (VND million)	-0.001	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Total HH member aged from 10 to 60	-0.001	0.003	0.001	0.006
	(0.003)	(0.003)	(0.006)	(0.005)
Ethnicity of the HH (1= Kinh & Hoa, 0=other)	-0.010	-0.031	-0.011	-0.040
	(0.017)	(0.030)	(0.027)	(0.051)
Age of the household head	0.007**	0.004	0.009**	0.006
	(0.003)	(0.002)	(0.005)	(0.004)
Square age of the household head	-0.000**	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Number of years in school of the HH head	0.005***	0.001	0.010***	0.001
	(0.001)	(0.001)	(0.002)	(0.002)
Sex of the household head (1=male, 0=female)	-0.032**	-0.018	-0.045*	-0.026
	(0.016)	(0.013)	(0.026)	(0.022)
Total agriculture land area owned by household (hectare)	-0.001	-0.006***	-0.002	-0.011***
	(0.003)	(0.002)	(0.005)	(0.004)

Independent variables	Dependent variable			
	SID		SW	
	(1)	(2)	(3)	(4)
Share of the agriculture land area having Land Use Certificate (LUC)	0.001	0.015	-0.004	0.019
	(0.012)	(0.012)	(0.020)	(0.020)
Share of the irrigated agriculture land of the household	-0.182***	-0.070***	-0.299***	-0.116***
	(0.013)	(0.014)	(0.021)	(0.023)
Number of agriculture land plots owned by household	0.058***	0.053***	0.114***	0.105***
	(0.004)	(0.003)	(0.007)	(0.006)
Percentage of household in village has migrated person (%)	-0.000		-0.000	
	(0.000)		(0.001)	
Distance from village to District town (km)	-0.001		-0.001	
	(0.001)		(0.001)	
Number of observations	1,890	1,890	1,890	1,890
Village fixed effect	no	yes	no	yes
Adjusted R2	0.2981	0.2832	0.3249	0.3297

Note: Constant not reported. Robust standard errors in parentheses. Cluster at commune level

*The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively.*

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

3.5.3 Diversification in the number of crops grown

One other way to measure diversification is to use the number of crops grown by the households. Table 3.5 shows the regression results of different models. It is clear that shocks have a strong significant positive impact on the number of crops grown by households. The household experienced with more shocks has grown statistically significant more crops than other households. However, like the result from land diversification, we do not see any significant impact of risk expectation on the crop diversification. The village fixed- effect models show a statistically significant negative effect total asset lost from shocks on the number of crops grown. We saw the same sign impact of access to credit on the crop diversification and it is consistent with the result from land diversification. However, labor and education of household head have positive and significant impacts on the level of crop diversification in the ordinal model that we do not

found in land diversification. In addition, age of household head does not significant impact on the number of crop grown by household. Models show the consistent result that irrigated agriculture land allows the household to specialize crop production and number of agriculture land plots is a barrier for specialization. As expected, the households living in the mountainous areas and far from the market grow more crops than other households. In addition, the households living in Ha Tinh province grow much more crops than other households living in Hue or Dak Lak. The results of this section also provides a clear picture, where the diversification of crop, measured as the number of crops grown, is one of the risk coping strategies.

Table 3.5: Determinant of number of crops grown

Independent variables	(1)	(2)
HH has experienced one shock in the past 5 years (1=yes, 0=no)	0.183*	0.108
	(0.103)	(0.078)
HH has experienced two shocks in the past 5 years (1=yes, 0=no)	0.233**	0.235***
	(0.113)	(0.086)
HH has experienced at least 3 shocks in the past 5 years (1=yes, 0=no)	0.302**	0.294***
	(0.126)	(0.097)
HH expected one risk in the next 5 years (1=yes, 0=no)	-0.001	0.017
	(0.093)	(0.096)
HH expected two risks in the next 5 years (1=yes, 0=no)	0.068	0.070
	(0.099)	(0.092)
HH expected three or more risks in the next 5 years (1=yes, 0=no)	0.054	0.006
	(0.104)	(0.087)
Total asset lost due to shocks in the past 5 years (VND million)	-0.001	-0.004*
	(0.003)	(0.002)
Household is currently borrowing (1=yes, 0=no)	0.193**	0.126
	(0.090)	(0.085)
Interaction between shock and borrowing	-0.190*	-0.113
	(0.106)	(0.094)
Total asset value of the household for agriculture production (VND million)	-0.002	-0.001
	(0.001)	(0.002)
Total household member aged from 10 to 60	0.028**	0.013
	(0.014)	(0.014)
Ethnicity of the household (1= Kinh & Hoa, 0=other)	0.028	-0.113

Independent variables	(1)	(2)
	(0.105)	(0.137)
Age of the household head	0.011	0.016
	(0.010)	(0.011)
Square age of the household head	-0.000	-0.000
	(0.000)	(0.000)
Number of years in school of the household head	0.015**	0.008
	(0.006)	(0.006)
Sex of the household head (1=male, 0=female)	-0.027	-0.023
	(0.060)	(0.058)
Total agriculture land area owned by household (hecta)	0.018	0.009
	(0.022)	(0.011)
Share of the agriculture land area having Land Use Certificate (LUC)	0.050	0.122**
	(0.083)	(0.054)
Share of the irrigated agriculture land of the household	-0.526***	-0.223***
	(0.079)	(0.061)
Number of agriculture land plots owned by household	0.439***	0.402***
	(0.029)	(0.016)
% HH has migrated person in the village	0.017	0.041*
	(0.027)	(0.024)
Distance from village to District town (km)	-0.003	
	(0.003)	
Village is located in the mountain (1=yes, 0=no)	0.308***	
	(0.095)	
Travel time to market (minutes)	0.005***	
	(0.002)	
Hue province (1=yes, 0=no)	-0.517***	
	(0.115)	
Dak Lak province (1=yes, 0=no)	-0.379***	
	(0.119)	
Number of observations	1,925	1,925
Village fixed effect	no	yes
Adjusted R2	0.472	0.450

Note: Constant not reported. Robust standard errors in parentheses. Cluster at commune level

*The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively.*

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

3.5.4 Diversification in the number of income sources

The most frequently used method to measure income diversification is the number of income sources. Table 3.6 shows the results of the regression models. It is obvious that shocks have a significantly positive effect on the number of income sources of the household in fixed- effect model. Households, which experience at least once shock during the past 5 years, have a higher number of income sources than the average. The more shocks experienced by households, the higher the number of income sources. Like the results from land and crop diversification sections, the impact of risks on the number of income source is not strong. This impact is only positive significant for the household with expectation of at least three risks in the next 5 years in the model 1. These results suggest that rural households in the three provinces diversified their resources into different income generating activities as only one of several shock coping strategies

The loss of asset due to the shocks could reduce the capacity of the household to maintain all income generating activities. Therefore, we see a negative effect of this variable on the number of income sources. Once again, as the regression results suggest, access to credit plays a very important role for the household to move into different income generating activities. The household, which is currently borrowing, has about 17% higher number of income sources than the average. The number of laborers is also a significant determining factor on income diversification but effect is small. An ethnic minority household has much higher income sources compared to the Kinh & Chinese household. As expected, education and age of the household head (as a proxy for working experience) have strong significant effects on the number of income sources. It is obvious that experience and education could give people more opportunities to move out of the agriculture sector. Households having more land could keep their laborers working on the agriculture sector and then have a significantly lower income diversification. Migration opportunity is measured as number of migration people in the village has strong positive impact on the number of income sources of the household. In addition, the location of the household also plays an

important role for diversifying income sources. Living far from the urban area is also a barrier for household members to migrate and work in non- farm occupation. Therefore, we found that the households living in the village located in the mountainous area have a substantially significant lower number of income sources than other households. Finally, the households living in Dak Lak province have lower number of income sources than two other provinces, which in part can be explained by the high concentration of coffee growing and the lack of industrial development in this province.

Table 3. 6: Determinant of number of income sources

Independent variables	(1)	(2)
HH has experienced one shock in the past 5 years (1=yes, 0=no)	0.127	0.218**
	0.102	0.086
HH has experienced two shocks in the past 5 years (1=yes, 0=no)	0.097	0.237**
	(0.110)	(0.096)
HH has experienced at least 3 shocks in the past 5 years (1=yes, 0=no)	0.169	0.282**
	(0.126)	(0.110)
HH expected one risk in the next 5 years (1=yes, 0=no)	0.105	0.065
	(0.097)	(0.098)
HH expected two risks in the next 5 years (1=yes, 0=no)	0.117	0.085
	(0.102)	(0.097)
HH expected at least 3 risks in the next 5 years (1=yes, 0=no)	0.232**	0.072
	(0.096)	(0.091)
Total asset lost due to shocks in the past 5 years (VND million)	-0.007***	-0.003
	(0.002)	(0.002)
Household is currently borrowing (1=yes, 0=no)	0.175*	0.162*
	(0.096)	(0.092)
Interaction between shock and borrowing	0.099	0.091
	(0.113)	(0.102)
Total production asset value of the household (VND million)	-0.000	0.000
	(0.001)	(0.001)
Total household member aged from 10 to 60	0.039***	0.037***
	(0.014)	(0.014)
Ethnicity of the household (1= Kinh & Hoa, 0=other)	-0.258***	-0.370**
	(0.095)	(0.151)
Age of the household head	0.004**	0.005***

Independent variables	(1)	(2)
	(0.002)	(0.002)
Number of years in school of the household head	0.029***	0.028***
	(0.006)	(0.007)
Sex of the household head (1=male, 0=female)	-0.058	-0.051
	(0.063)	(0.062)
Total agriculture land area owned by household (hecta)	-0.036**	-0.022*
	(0.015)	(0.012)
Share of the agriculture land area having Land Use Certificate	0.029	-0.012
(LUC)	(0.059)	(0.058)
Share of the irrigated agriculture land of the household	0.093	0.227***
	(0.061)	(0.065)
Number of agriculture land plots owned by household	0.121***	0.076***
	(0.022)	(0.017)
% HH has migrated person in the village	0.056*	0.062**
	(0.031)	(0.027)
Distance from village to District town (km)	-0.000	
	(0.004)	
Village is located in the mountain (1=yes, 0=no)	-0.325***	
	(0.063)	
Hue province (1=yes, 0=no)	0.086	
	(0.076)	
Dak Lak province (1=yes, 0=no)	-0.149*	
	(0.089)	
Number of observations	2,137	2,137
Village fixed effect	no	yes
Adjusted R2	0.137	0.095

Note: Constant not reported. Robust standard errors in parentheses. Cluster at commune level

*The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively.*

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

3.6 Summary and Conclusion

Vietnam is among the countries that could be severely affected by climate change and natural disasters as well as from the effects of globalization and integration

into the world market. Using data from the first phase of the household survey in three provinces in Central of Vietnam, conducted within the scope of the DFG research project "Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies", it can be concluded that self-insurance mechanisms are applied to cope with shock. However our analysis generates some evidence that households diversify their portfolio into different income generating activities in order to cope with shocks. Households diversify their land into different crops and balance the land for each crop in order to cope with shocks. While land diversification is used for both ex-post coping and ex-ante risk management, the labor diversification is only found in the high risk-adverse households. As result, we found that the number of crops grown and the number of income sources from the households experienced with shock are higher than others. Access to credit, the number of the household labors, education of the household head, and the wealth of the household, as well as infrastructure, irrigation and land fragmentation, are also the important factors that drive the level of diversification chosen by a household.

With the dominant and increasing of the shocks, the poor infrastructure, land fragmentation, lack of agriculture insurance system in rural area in Vietnam, there would raise the suggestion that increasing public investment (infrastructure, credit) and pushing the land reconsolidation program could help the households to diversify their portfolio and then reduce the vulnerability to poverty. In addition, whether the diversification, one of the self- insurance mechanisms, is enough for household to cope with shocks or it need to have the government insurance system that could protect the household to reduce the vulnerability of the shocks. The comparison with Thailand households is also useful to have additional concrete findings. These are the suggestions for future analysis using the panel data from the DFG project.

Chapter 4

Diversification and Vulnerability to Poverty[12]

4.1 Introduction

Thailand and Vietnam are two emerging market economies where agriculture still plays an important role even though its contribution to GDP has been reduced from 16% and 40% in 1985 to around 12% and 22% in 2008, respectively[13]. In the rural areas, however, agriculture is still the major source of income and employment. Agriculture in Thailand and Vietnam has differences as well as similarities. One of the main differences relates to the historical perspective. In Vietnam, prior to the introduction of the *doi moi* policy, performance of the agricultural sector was strongly influenced by the centrally planned economic system. The policy change towards a market-based pricing system of agricultural commodities can be seen as a starting point for a period of sustained growth in output and productivity. Today, Vietnam has become a major player in world food markets and the country now ranks third among the world's leading rice exporters. However, Vietnam's economic policy reform has also introduced risks into the agricultural sector and the rural areas. The process of liberalization and rapid integration into the world economy with less trade protection and reduced subsidies has exposed the domestic markets to the fluctuations of the international markets. In contrast, such risks are not as severe

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[12] This chapter is a revised version of the paper: Praneetvatakul,S., Tung, D. P., and H. Waibel (2010), "Diversification and Vulnerability to Poverty: A comparison between Vietnam and Thailand" In: S. Klasen and H. Waibel (eds) Vulnerability to poverty: Theory, measurement, and determinants, Palgrave

[13] http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS

in Thailand as the agricultural sector has benefited from a long history of commercialization and market orientation. Thailand is now the top exporter for a number of agricultural raw materials and processed food products. The country has a well-developed agribusiness sector with some large multinational co-operations.

In terms of the natural conditions for agricultural production, Thailand is more favored than Vietnam. High weather risks such as storms, floods and droughts are typical threats for a large part of Vietnam's agricultural areas. Drought is often recorded in the Central Highlands, while floods, typhoons, and storms are very frequent in the North Central Coast (Chaudry and Ruysschaert 2007). Vietnam in the recent years has also been strongly affected by livestock diseases such as the Avian Flu and Foot and Mouth disease. Rural households are mostly affected by these threats with strong implications for the economy, considering that the agricultural sector accounts for almost half of total household income and absorbs 64 percent of the labor force in rural area in Vietnam (GSO 2006). The likelihood of disasters is also increasing because of global climate change. A recent study by Dasgupta et al. (2009) on the potential impacts of sea level rise in 84 coastal developing countries showed that a 1-meter rise in sea level would affect about 7 percent of agricultural land and 11 percent of the population, which could reduce the agriculture sector's GDP by 10 percent. The highly diverse geographic and geomorphologic conditions in Vietnam lead to large heterogeneity of agricultural systems including highly diversified subsistence agriculture in the marginal, mostly mountainous areas and specialized farming in the more favored regions.

While drought and flood also affect parts of agricultural land in Thailand, the magnitude of such shocks are generally less severe than in Vietnam because Thailand has better infrastructure especially in terms of irrigation and transportation. There is also a difference in the structural conditions and the organization of agriculture. For example, while in Vietnam, farm size is small and labor intensity is high, in Thailand the level of mechanization, for example, in planting and harvesting is much more advanced.

However, while there are many differences between the agriculture of Thailand and Vietnam there are also similarities between the two. In both countries, agriculture has expanded to the marginal areas, which are marked by remoteness, poor infrastructure, and unstable job prospects and as a result of high rates of rural-urban migration, and often dysfunctional traditional village institutions.

Although even in these areas poverty has declined, households remain vulnerable to poverty due to the risky environment in which they live. Because of the absence or imperfection of formal insurance and credit markets, households in such areas often employ self-insurance strategies (Besley 1994), among which activity diversification is a major measure.

This paper compares diversification strategies in the six provinces in Thailand and Vietnam included in the project[14]. Such country comparison are necessary to better understand the success and failure of self-insurance mechanisms in agriculture in emerging market economies, which can provide important lessons to policy makers.

The chapter is organized as follows. The next two sections provide the methodology and data used for measuring diversification and its impact on the well-being of rural households and their degree of vulnerability to poverty. The empirical results are presented in section 4.4. The last section presents some conclusions for policy and further research.

4.2 Diversification and Vulnerability

The main objectives of this chapter are to measure diversification strategies of rural households in Thailand and Vietnam and to assess the effect of diversification strategies on household consumption. In addition, the chapter is also to explore the impact of diversification on vulnerability to poverty of rural households in both countries that some theoretical consideration is given in the

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[14] DFG Research Unit 756, see chapter 1

first part of this section. Thereafter, the quantitative measures of diversification are defined.

Reducing income risk by selecting a mixture of activities whose net returns have a low or negative correlation, is a major strategy of self-insurance based risk management (e.g. Di Falco et al. 2007, Just and Pope 2003, Dunn 1997, Reardon et al. 1992). Diversification through combining activities with low positive covariance and income-skewing effects is a measure traditionally employed by risk-averse small-scale farmers in developing countries. To date most studies related to diversification have investigated the impact on expected mean and variance of income (e.g. Lanjouw et al. 2001; Ersado 2006). These analyses mostly ignored the role that the environmental and economic shocks play when poor farmers decide to diversify. However, when developing a strategy to reduce vulnerability to poverty, assessing the role of activity diversification should be considered (see CGIAR 2005; Slater et al. 2007; IFAD 2008; Tingem and Rivington, 2009). While most previous studies showed that agricultural diversification can help to reduce income risk and concluded that such a strategy can be effective in reducing poverty (Barghouti et al. 2002; Ahmad and Isvilanonda 2003; Pingali 2004), it is less clear as to what extent diversification is also an effective strategy to reduce vulnerability to poverty in the rural areas of emerging market economies like Thailand and Vietnam.

To analyze diversification decisions of rural households and their effect on reducing vulnerability, it is necessary to incorporate covariate and idiosyncratic shocks in the respective models (Dercon 1999). Generally, poor households living in high risky environments have developed rather sophisticated (ex-ante) risk-management and (ex-post) risk-coping strategies. For example, Menon (2006) in a study in Nepal found that households used the occupational choice as strategy to cope with rainfall uncertainty. When examining the response to covariate flood and idiosyncratic health shocks among peasant households in the Amazonian tropical forests, Takasaki et al. (2002) found that coping strategies include various diversification activities like collection of food from natural resources, upland cropping and labor adjustment.

The methodology for comparing diversification strategies of rural households in six provinces in Thailand and Vietnam follows two steps. First, diversification is analyzed as a function of village and household characteristics, shock events experienced by the household and the perceived future risks. In the second step, diversification is used to assess the impact on vulnerability to poverty[15]. In developing a model suitable to explain diversification decisions, Ersado (2006) has listed some important variables: (a) missing or imperfect insurance and credit markets that persuade households to take up self insurance measures, (b) incomplete input and output markets resulting in the inability to specialize and promote diversification in consumption, (c) ability of ex-post coping actions, (d) complementarities and positive interactions between activities, and (e) returns to assets which can vary across assets, time and space.

Comparing diversification strategies of rural households between two countries is useful based on aggregate measures, such as land and labor allocation decisions. For land, households may select agricultural enterprises where the correlation between price and yield is low or adjust the crop portfolio to the specific characteristics of their land, i.e., growing different crops on different parcels of land in order to minimize the effect of biotic or a biotic stresses. The second option is for households to reallocate their labor into non-farm activities since it can be assumed that wage income is largely uncorrelated with agricultural income. In addition, non-farm income can help to accumulate assets in a good agricultural year, which increases the household's capacity to smooth consumption in the years where shocks affect agriculture.

Based on the analysis of some of the features of agriculture in Thailand and Vietnam and this brief review of the literature, it can be hypothesized that generally activity diversification could be an important strategy for rural households also in emerging market economies. Secondly, it can be expected that

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[15] The data used for this analysis come from a panel household survey carried out under the auspices of the DFG research project "Impact of Shocks on the Vulnerability to Poverty: Consequences for Development of Emerging Southeast Asian Economies."

the diversification strategy will depend on the socio-economic and institutional conditions in the two countries.

There are several methods to measure the diversification as discussed by Culas et al. (2005) and Minot et al. (2006). In this study, two diversification indices, namely the Simpson Index of Diversity (SID) and the Shannon-Weaver index (SW) are used. These were calculated for both land and labor as the two major resources of rural households. The SID gives more weight to the dominant activities of the household portfolio allocation, which is not the case with the SW index, which underscores the dominant activities within the portfolio.

The SID is defined as:

$$SID = 1 - \sum_i P_i^2$$

where, Pi is the proportion of household portfolio allocated to activity i. The index ranges from 0 to 1, with 0 if a household devotes all resources to one activity and approaches 1 with rising number of activities in the portfolio.

The SW is defined as:

$$SW = -\sum_i P_i Ln(P_i)$$

P_i is again the proportion of activity i in the portfolio.

The diversification indices for labor allocation were based on the main occupations of the household members aged from 10 to 60. Hence, P_i is the proportion of the household labor devoted to each of the three main occupations, i.e. agriculture, wage employment, and non-farm self-employment. The SID and the SW for agricultural land were based on the area that households allocated to each crop during the crop year 2006/07. Thus, P_i is the share of the total agricultural land allocated to crop i. In Thailand 23 crops were included and in Vietnam a total of 26 crops were considered.

4.3 Data and methodology

4.3.1 Data

The data used for this analysis are from the two waves of a household survey conducted in three provinces, both in Vietnam (Dak Lak, Hue, Ha Tinh) and Thailand (Buriram, Ubon Ratchathani, Nakhon Phanom). The data for this analysis were taken from a comprehensive questionnaire of a total of almost 4400 households and 440 village questionnaires. The sample was distributed proportionately to the population size of each district. Adjustments to over-sampling in the remote areas in Vietnam where the population is small and thus the number of households would have been insufficient for the estimation[16] , was undertaken. Hence, a weighting procedure was applied to adjust for over-sampling in remote areas. Two questionnaires were used in this survey, one for the household and the other one for the village. In both waves, the household questionnaire was administered to collect information about various aspects of the socio-economic conditions of the household. It includes demographic conditions, migration, education, health, agriculture, off-farm and non-farm employment, borrowing and lending, remittance, insurance, consumption and assets. There is a special section that collects information about the different types of shocks that the household has experienced since 2002 and the different types of future risks that the household perceives to exist in the next five years. It includes the common (flood, drought, storm, avian flu) and the idiosyncratic (sickness, death, accident, loss of job, bankruptcy) shocks and risks. For each type of shock and risk, the respondent was asked to evaluate the impacts on his/her household as well as the coping strategies that the household used to cope with the shock. In the agriculture section, data were collected on agricultural land, the type of crops, grown area, cost and output of each crop that a household has grown in the past 12 months. In addition, household members were also asked to report about type of jobs, the duration, income and cost for

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[16] Detailed information about sample design of this survey is discussed in Hardeweg et al. (2006) "Sampling for vulnerability to poverty: Cost effectiveness versus precision".

each type of occupation. This information can be used to calculate the SID and SW indices for each household.

The village questionnaire contains information about the infrastructure and basic public goods that could affect the livelihoods of the households and the decision of the households to cope with Shock and Risk[17].

4.3.2 Model to explain diversification

A linear regression model was used to measure the effect of shocks and risk on the portfolio and income diversification of the household.

(1) $$Y_{ij} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{ijk} + \sum_{n}^{N} \gamma_n S_{ijn} + \sum_{m}^{M} \varphi_m R_{ijm} + \varepsilon_{ij}$$

Where Y_{ij} are the measures of diversification for labor and land of household *i* in village *j*, number of income sources and number of crops grown by household *i* in village *j*.

X_{ijk} are variables reflecting the various household and village characteristics believed to influence the diversification decision of a household.

A variable S_{ijn} for agricultural and economics shocks was included while social and demographic shocks were excluded as these are not expected to have any impact on the diversification decision of the household. S_{ijn} was defined as dummy variable to capture the number of shocks of the household *i* in village *j*. R_{ijm} was included as risk variable. These reflect the likelihood of different types of events that the respondent, representing the household, would expect to take place in the next five years and the impacts of these events on the household. R_{ijm} has the same variable labels as S_{ijn}. Thus, R_{ijm} reflects the risk management strategy of the household while S_{ijn} refers to the risk coping strategy.

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[17] For details of data collection: see chapter 2

4.3.3 The effect of diversification on household consumption

Diversification of a household portfolio is expected to contribute to income stability, smoothness of consumption and reduce the vulnerability of the household to poverty. In this section, we investigate the impact of labor and land diversification on household consumption. This relationship is the pre-condition to establish a linkage between diversification and vulnerability; the latter defined as expected consumption to fall below a defined benchmark (poverty line). As pointed out by Deaton (1992), the main factors hypothesized to explain future consumption of a household are its current income and wealth, expected income and its variance, and the ability to smooth consumption in case of income shocks. These factors depend on household characteristics and other external factors. The reduced form of the general consumption function could be expressed as:

(2) $C_{it} = C(X_i, \beta_t, S_{it}, \delta_{it}, e_{it})$

Where C_{it} is the consumption of the household *i* at the time *t* and X_i is a bundle of the household characteristics, S_{it} is the shock faced by household *i* at time *t*, and β_t and δ_{it} are the corresponding regression coefficients and e_{it} is the error term.

To measure the impact of diversification on consumption or income requires panel data because reallocation of resources may not immediately be measurable. For instance, changes in livestock along with allocation of land towards feed crops, may lead to a higher production only in the following season or year. In addition, moving labor from agriculture to non-farm activities may require other farm or household adjustments, whose impacts in terms of income or consumption can only be measured later. The model developed here follows the models applied by and Hall (1995), Dercon and Krishnan (2000), Ersado (2006), and Isik-Dikmelik (2006). However, the model used here benefits from the panel nature of the data and thus allows relating land and labor allocation

decisions in the previous period with household consumption in the current period. This is formalized in the following equation:

(3) $LnC_{it+1} = \alpha_i + \theta_t D_{it} + \beta_t X_{it} + \gamma_t \Delta X_i + \delta_{it+1} S_{it+1} + \varepsilon_{it+1}$

Where LnC_{it+1} is the log of household consumption of the household i in 2008, D_{it} is the land or labor diversification of the household in 2007, X_{it} are household characteristics in the year 2007 and ΔX_i is the change in household characteristics between 2008 and 2007, S_{it+1} are shocks that the household faced in 2008.

Deaton (1992) showed that consumption is dependent on income. Since in our models, land and labor diversification are correlated with household income, they are also correlated with the error term of equation (4). Hence, an OLS regression could give a biased estimate. To overcome this problem, an instrumental variable approach was applied as recommended by Davidson and Mackinnon (1993). The first stage of a two-stage least squares (2SLS) procedure is defined as:

(4) $D_{it} = \omega_i + \varphi_t X_{it} + \pi_{it} Z_{it} + u_{it}$

Where X_{it} is a vector of explanatory variables for both, equation (3) and equation (4); Z_{it} are instrumental variables that affect land or labor diversification D_{it}. These variables affect consumption only indirectly. As instrumental variables, the number of land plots a household is using for cropping and the share of households with one or more migrants are used. Wald tests of endogeneity are used to assess the validity of these assumptions.

4.3.4 Measuring the impact of diversification on vulnerability to poverty

The last hypothesis to be assessed is to what extent diversification as a self-insurance strategy is effective in reducing vulnerability to poverty. In defining the latter we refer to the most common method of vulnerability, namely the probability to fall below the poverty line in the future (Chaudhuri 2003;

Christiaensen and Boisvert 2000; Prichett et al. 2000). Due to the lack of the panel data, most current papers have used cross-sectional data to estimate the vulnerability to poverty of a household., We propose a probit model to estimate the chance of household consumption observed in the year *t+1*(2008) by the household characteristics and household land and labor diversification decision in 2007. In addition, we add the shocks occurred in 2008. The following equation is developed:

(5) $$V_{it} = P_i\left(\ln C_{it+1} < \ln z\right) = \alpha_i + \theta_t D_{it} + \beta_t X_{it} + \delta_{it+1} S_{it+1} + \varepsilon_{it+1}$$

In order to capture the endogeneity problem as described under 3.3, a two stage least squares estimation procedure with the same instrumental variables as specified in equation (4) are used.

4.4 Results

In this section, the results of the models outlined above are presented. First, a comparison is made between the factors that determine diversification of land and labor in both countries using the two diversification indices defined above. Next, the results of the consumption function are presented, and finally the relationship between diversification and vulnerability to poverty is established which allows to draw some policy conclusions relevant for both countries.

4.4.1 Diversification

Figures 4.1a and 4.1b show the distribution of land (4.1a) and labor (4.1b) diversification measured by the Simpson Index of diversification (SID). The two graphs underline the differences between the provinces of the two countries especially in land diversification. Clearly, in the three Thai provinces a large share of crop production is monoculture consisting mainly of rice, cassava and rubber in areas with better agricultural conditions. In Vietnam, while there is practically no fully specialized farm-level crop production, farms are more diversified than in Thailand with the majority of households having an SID of more than 50 percent. The difference in labor diversification, however, is less pronounced although it is higher in Thailand. Overall, the pattern of land and

labor diversification is a good reflection of the differences in the socio-economic and institutional conditions of agriculture in the two countries. Agriculture in Thailand is marked by a kind of dualistic pattern with specialized farms on the one hand and the existence of part-time farms on the other, having a high share of household members working on off-farm activities. In Vietnam, farming is still more subsistence oriented, and wage employment opportunities are still less developed. Hence, mixed cropping is a typical land use system in Vietnam, especially in the more remote areas.
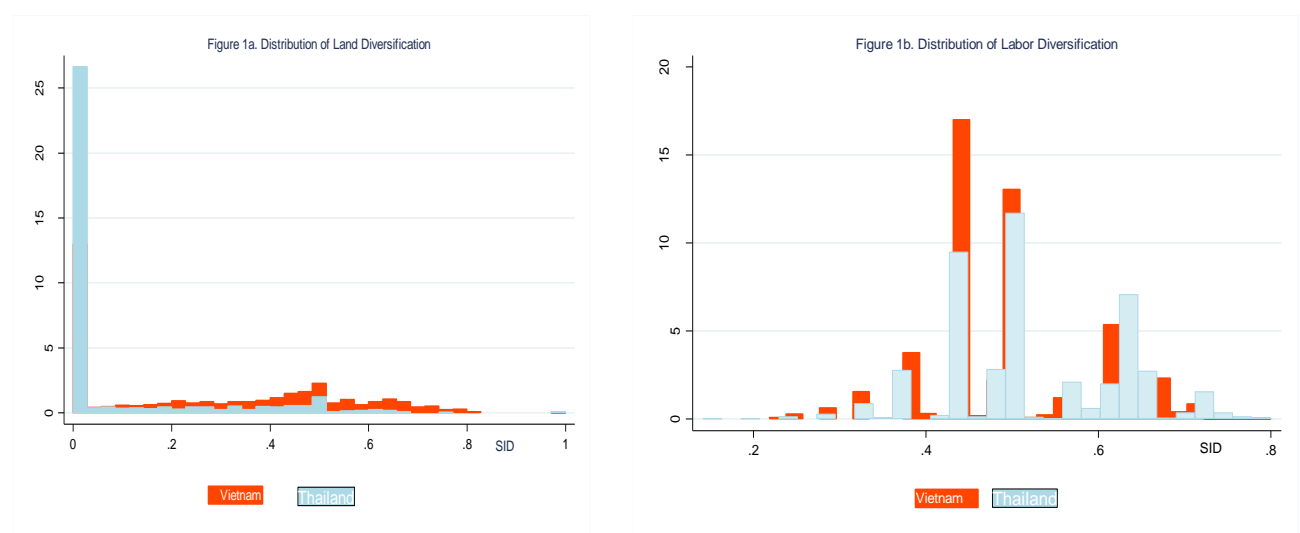
Figure 4. 1a and 4.1b: Frequency Distribution of Land and Labor of Simpson Index of Diversification

Table 4.1 presents the variables included in all subsequent models, namely (i) diversification model, (ii) consumption model and (iii) vulnerability model. The mean and standard deviations show the major differences between rural households in the two countries comparing the diversification indices between the two countries, the shocks experienced and the risks perceived by the respondents. The data show that in Thailand, consumption is higher and poverty, based on head count ratio, is more severe in Vietnam. In both countries, however, poverty is above national average. As discussed in section 1, Vietnam is more affected by climate-related risks, which is reflected in the difference in number of shocks (Table 4.1). The difference in shock experience, however, is

not really reflected in the risk expectation. For example, 67 percent of the households in Thailand expected three or more risky events to occur in the next five years, in contrast to only 50 percent of households in Vietnam. On average, land endowment in Thailand is several times higher in Vietnam and land security through titling is more advanced in Thailand. Labor capacity, measured by the number of household members aged from 10 to 60, is similar in both countries. On the other hand, formal education measured by number of years in school is higher in Vietnam than in Thailand. Access to irrigation in Vietnam is four times that of Thailand, while urban-rural migration can be observed in both countries.

Table 4. 1: Variables and descriptive statistics of diversification models, Thailand and Vietnam, 2007 survey

Variable codes	Variables	Thailand		Vietnam	
		Mean	Std. Dev.	Mean	Std. Dev.
SID_land	Diversification of land based on SID	0.07	0.15	0.27	0.25
SW_land	Diversification of land based on SW	0.13	0.26	0.46	0.44
SID_labor	Diversification of labor based on SID	0.43	0.22	0.35	0.24
SW_labor	Diversification of labor based on SW	0.66	0.38	0.53	0.38
Log_cons08	Log of consumption per capita in 2008 ($PPP)	7.20	0.65	6.90	0.59
Poor08	Poor household in 2008 (1=yes, 0=otherwise, using 2$PPP per day)	0.16	0.36	0.29	0.45
S1	HH has experienced at least one shock in the past 5 years (1=yes, 0=no)	0.35	0.48	0.41	0.49
S2	HH has experienced at least two shocks in the past 5 years (1=yes, 0=no)	0.05	0.23	0.16	0.37
S3	HH has experienced 3 or more shocks in the past 5 years (1=yes, 0=no)	0.02	0.13	0.03	0.18
R1	HH expected at least one risk in the next 5 years (1=yes, 0=no)	0.10	0.30	0.15	0.35
R2	HH expected at least two risks in the next 5 years (1=yes, 0=no)	0.15	0.36	0.21	0.40
R3	HH expected 3 or more risks in the next 5 years (1=yes, 0=no)	0.67	0.47	0.50	0.50
Aloss	Total asset lost due to shocks in the past 5 years (VND million or 1000 bath)	15.19	78.66	4.17	10.61

Variable codes	Variables	Thailand		Vietnam	
		Mean	Std. Dev.	Mean	Std. Dev.
Borr	Household is currently borrowing (1=yes, 0=no)	0.80	0.40	0.66	0.47
SxBorr	Interaction between shock and current borrowing	0.49	0.50	0.55	0.50
Agri_asset	Total asset value for crop production (VND million or 1000 bath)	59.32	143.96	6.80	18.08
Labor	Total HH member aged from 10 to 60	3.71	1.75	3.68	1.91
Ethnic	Ethnicity of the household (1= Kinh & Hoa, 0=other)	0.93	0.25	0.79	0.40
Age_hh	Age of the household head	54.75	13.25	47.94	13.86
Sage_hh	Square age of the household head	3172.91	1521.17	2490.37	1465.98
School_hh	Number of years in school of the household head	4.89	3.05	6.63	4.02
Sex_hh	Sex of the household head (1=male, 0=female)	0.74	0.44	0.84	0.36
D_ratio	Dependency Ratio (year 2008)	0.42	0.50	0.48	0.53
Land	Total land area owned by household (hecta)	2.50	3.53	0.79	1.73
Land_LUC	Share of the household land area having Land Use Certificate (LUC)	0.90	0.28	0.64	0.45
Land_irri	Share of the irrigated land of the household	0.10	0.29	0.46	0.45
Land_plot	Number of Agriculture land plots	2.61	1.20	3.42	1.71
Migrant	Percentage of household in village has migrated person (%)	52.47	18.79	35.87	19.70
Distance	Distance from village to District town (km)	13.45	8.18	13.64	10.32
Shock08	Household experienced with at least one shock in 2008	0.59	0.49	0.70	0.46
Hhsize07	Household size 2007	4.89	2.00	4.86	1.81
Tot_asset07	Total asset value in 2007 (VND million or 1000 bath)	59.93	144.17	7.34	19.28
Diff_hhsize	Difference in household size	0.27	0.88	0.13	0.51
Diff_tot_asset	Difference in total asset (VND million or 1000 bath)	-41.37	128.68	1.28	17.37
Diff_D_ratio	Difference in dependency ratio	0.03	0.33	0.02	0.29
Shool_adult	Average number of years in school of household member aged 10 to 60	0.44	2.27	7.52	3.21
Mtransport	Main transportation of the village (1=	0.96	0.19	0.50	0.50

Variable codes	Variables	Thailand		Vietnam	
		Mean	Std. Dev.	Mean	Std. Dev.
	motorbike, bus, 0=walk, bicycle, ox cart)				
Coastal_Area	Household is living in Coastal Area (1=yes, 0=otherwise)	n/a	n/a	0.27	0.45
Lowland_Area	Household is living in lowland rice area (1=yes, 0=otherwise)	n/a	n/a	0.32	0.47
Buri	Household is living in Buriram province (1=yes, 0=otherwise)	0.37	0.48	n/a	n/a
Ubon	Household is living in Ubon Ratchathani (1=yes, 0=otherwise)	0.44	0.50	n/a	n/a

Source: Authors calculations based on the DFG survey 2007 and 2008

The first model explains the labor diversification and allows a comparison between the two countries. Results are shown in table 4.2. By and large, the factors that explain diversification of labor, measured by SID and SW, differ between Thailand and Vietnam. We find that some of the shocks are significant in the Thailand model, which suggests that households use reallocation of labor as an ex-post coping strategy. However, this strategy seems less feasible in Vietnam due to lower off- and non-farm opportunities. In both countries, however, expected risks lead to labor diversification, which suggests that rural households who anticipate a riskier future tend to place their labor outside agriculture as an ex-ante coping measure. Several of the significant variables underline similar structures in both countries. For instance, household's labor capacity and the number of land plots show a significantly positive effect. Among the variables that show a significant negative effect on diversification is the age of the household head. Often, households with older people have a lower propensity to migrate or may they have returned home from urban migration. Also, the negative effect of the land size variable in both countries suggests that larger farms are less likely to be engaged in off- or non-farm work. Likewise longer distance to the village from the nearest district town reduces the households' ability to diversify labor in Vietnam. Furthermore, the significant interaction between borrowing and shocks in Vietnam shows that access to credit can be

important to enable households to smooth consumption in response to shocks through the diversification of labor[18]. When comparing the two-diversification measurements, the models show quite consistent results. Therefore, in the subsequent analysis we limit the analysis to one measure of diversification, namely the SID.

In conclusion, households in Thailand seem to be in a better position to move labor quickly outside of agriculture to both the formal and informal labor market. This possibility is more limited in Vietnam. However, in both countries, high risky expectation is a driving force to reallocate labor into different sectors.

Table 4. 2: Results of Model to explain labor diversification

Independent variables	Thailand		Vietnam	
	SID	**SW**	**SID**	**SW**
S1	0.034**	0.054**	-0.004	-0.014
	(0.013)	(0.022)	(0.013)	(0.021)
S2	0.029	0.051	-0.018	-0.032
	(0.020)	(0.035)	(0.018)	(0.029)
S3	0.012	0.022	-0.028	-0.056
	(0.036)	(0.060)	(0.033)	(0.051)
R1	0.022	0.030	0.018	0.030
	(0.023)	(0.037)	(0.020)	(0.030)
R2	0.045**	0.067*	0.024	0.041
	(0.022)	(0.036)	(0.019)	(0.029)
R3	0.058***	0.087***	0.033**	0.048*
	(0.020)	(0.033)	(0.017)	(0.026)
Aloss	0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)
Borr	0.012	0.018	-0.034*	-0.060**
	(0.016)	(0.026)	(0.019)	(0.030)
SxBorr	-0.002	-0.002	0.063***	0.106***
	(0.016)	(0.027)	(0.019)	(0.030)

[18] When using a fixed effects model and omitting the village variables reduced the overall fit of the model suggesting that location factors are influential of labor diversification.

Independent variables	Thailand		Vietnam	
	SID	SW	SID	SW
Agri_asset	0.000**	0.000**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Labor	0.039***	0.074***	0.028***	0.050***
	(0.003)	(0.005)	(0.003)	(0.005)
Ethnic	n/a	n/a	0.019	0.040
	n/a	n/a	(0.018)	(0.028)
Age_hh	-0.001***	-0.001**	-0.001***	-0.002***
	(0.000)	(0.001)	(0.000)	(0.001)
School_hh	0.001	0.001	0.002	0.004
	(0.002)	(0.003)	(0.002)	(0.002)
Sex_hh	0.005	0.010	-0.014	-0.025
	(0.012)	(0.019)	(0.016)	(0.025)
Land	-0.005***	-0.009***	-0.008*	-0.012**
	(0.002)	(0.003)	(0.004)	(0.006)
Land_LUC	-0.027	-0.041	-0.019	-0.029
	(0.019)	(0.033)	(0.012)	(0.019)
Land_irri	0.026	0.037	0.041***	0.062***
	(0.016)	(0.027)	(0.012)	(0.019)
Land_plot	0.019***	0.032***	0.010***	0.018***
	(0.004)	(0.007)	(0.003)	(0.006)
Migrant	0.001***	0.002***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Distance	-0.001*	-0.003**	-0.001**	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Number of observations	1,984	1,984	2,091	2,091
Adjusted R2	0.161	0.180	0.100	0.112

Note: Constant not reported. Robust standard errors in parentheses. The symbols *, **, and ***
indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively.

Source: Authors calculations based on the DFG survey 2007 and 2008

The land diversification model can provide information about the ability of rural households to use land diversification as a self-insurance measure in response to particularly agricultural shocks. Table 4.3 shows that shock and risk variables have a significant positive impact on the land allocation in Vietnam but are insignificant for the Thailand sample. One reason could be that the higher share

of non-farm activities in the total household income of the Thai households and the more advanced process of rural-urban migration has a profound effect on their portfolio of agricultural activities. On average, households in the three provinces in Thailand have only 1.38 crops compared to 2.22 in Vietnam. The part-time nature of farming in many of the remote, low potential agricultural areas in rural Thailand puts more limits on land diversification as a coping strategy than is the case in Vietnam. Contrary results can also be observed for farm size and the share of irrigated land. In Thailand, these two variables are significantly positively related to diversification while the opposite is the case in Vietnam. Larger farms with good infrastructure in Thailand tend to have a highly commercialized agriculture and thus diversify their agricultural portfolio. In Vietnam, farm size is smaller and when irrigation infrastructure exists, this is more likely to stimulate intensive rice production. Furthermore, in Vietnam older household heads tend to have a more diversified crop portfolio possibly due to their knowledge, their attitude to risk and their higher experience with shocks.

In both countries, households with good access to credit and a higher number of agricultural plots tend to have a more diversified crop portfolio. However, the interaction between shocks and credit access is only significant in Vietnam for the SID index. Generally, the results are consistent with the results of the two country models. In conclusion, shocks and risks are influential for land allocation decision of the households in Vietnam, while in Thailand for full-time farms other driving forces such as the existing and upcoming commercial opportunities make households to adopt a wider agricultural portfolio.

Table 4. 3: Results of Model to explain land diversification

Independent variables	Thailand		Vietnam	
	SID	SW	SID	SW
S1	-0.011	-0.019	0.026**	0.039*
	(0.011)	(0.018)	(0.013)	(0.022)
S2	-0.009	-0.015	0.072***	0.116***
	(0.019)	(0.031)	(0.018)	(0.031)
S3	-0.008	-0.001	0.107***	0.175***
	(0.037)	(0.062)	(0.033)	(0.056)
R1	0.005	0.002	0.046**	0.059*
	(0.022)	(0.034)	(0.019)	(0.031)
R2	-0.002	-0.003	0.048***	0.076***
	(0.020)	(0.030)	(0.017)	(0.029)
R3	0.003	0.007	0.039**	0.062**
	(0.020)	(0.031)	(0.015)	(0.026)
Aloss	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Borr	0.027**	0.040**	0.045**	0.068**
	(0.012)	(0.018)	(0.019)	(0.031)
SxBorr	0.005	0.013	-0.026	-0.037
	(0.013)	(0.020)	(0.019)	(0.032)
Agri_asset	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)
Labor	-0.000	-0.001	-0.001	0.002
	(0.003)	(0.004)	(0.003)	(0.006)
Ethnic	n/a	n/a	-0.010	-0.011
	n/a	n/a	(0.017)	(0.025)
Age_hh	-0.001	-0.002	0.007**	0.010**
	(0.002)	(0.003)	(0.003)	(0.005)
Sage_hh	0.000	0.000	-0.000**	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
School_hh	0.000	0.001	0.005***	0.010***
	(0.002)	(0.003)	(0.001)	(0.002)
Sex_hh	0.009	0.017	-0.032**	-0.045*
	(0.010)	(0.014)	(0.016)	(0.026)
Land	0.003**	0.005**	-0.001	-0.002
	(0.001)	(0.002)	(0.003)	(0.005)

Independent variables	Thailand		Vietnam	
	SID	SW	SID	SW
Land_LUC	-0.009	-0.011	0.001	-0.004
	(0.017)	(0.025)	(0.012)	(0.020)
Land_irri	0.033**	0.047**	-0.182***	-0.300***
	(0.014)	(0.021)	(0.013)	(0.021)
Land_plot	0.046***	0.076***	0.058***	0.114***
	(0.006)	(0.010)	(0.004)	(0.007)
Migrant	-0.000	-0.000	-0.000	-0.008
	(0.000)	(0.001)	(0.000)	(0.020)
Distance	0.000	0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Number of observations	1,702	1,702	1,890	1,890
Adjusted R2	0.146	0.160	0.292	0.325

Note: Constant not reported. Robust standard errors in parentheses

The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and

1 percent level respectively.

Source: Authors calculations based on the DFG survey 2007 and 2008

4.4.2 Effect of diversification on household consumption

In this section the effects of land and labor diversification decisions in 2007 on household consumption in 2008[19] is investigated. Table 4.4 presents the regression results of 2SLS models[20]. Results confirm the difference in structure and organization of agriculture between the two countries. In Thailand, labor diversification has a positive effect on household consumption while in Vietnam, it is diversification of land. The equations generally give consistent results with the expected signs of the regression coefficients. Age, education of the household head, overall education level of household members engaging in productive activity and value of productive asset have significant and positive coefficients.

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[19] As mentioned in section 2, the Simpson Index of Diversification (SID) has a value in the range from 0 to 1. A household is considered as not being diversified if its SID index has the value 0 and vice versus when it has value 1. For interpretation, we change the value of SID land and labor of the household in percentage. For instance, if the SID land index has a value of 0.35, it will have a value of 35 in our models.

[20] The test of endogeneity shows that we can reject H0 that land and labor diversification are exogenous variables for both countries.

Household size and dependency ratio are significant but they affect consumption negatively. The panel nature of our data provides additional explanatory variables. For example, the change in productive assets between the two survey years has a positive effect on consumption. Our model results support the notion of expanding the productive capacity in agriculture in response to rising food prices in 2008, which in turn leads to higher consumption for net sellers of food. We found that per capita consumption of households, who invested more in productive assets in 2008, had increased significantly in both countries. However, the effect is more pronounced in Vietnam as compared to Thailand. In addition, the increase in household size between the two years has a negative effect on consumption in the three Thai provinces. This could be a result of the back migration of household members due to the economic downturn in 2008.

Reducing consumption to cope with shocks is one of the major coping strategies of the household. However, in Vietnam shocks were found to be significant for household consumption. It suggested that consumption smoothing to cope with shocks is limited in Vietnam compared to households in Thailand. Other interesting differences between the two countries are shown in transportation infrastructure. Households living in the village with poor means of transportation (bicycle or ox cart) show lower levels of consumption. This is different in Thailand where motorized transportation is highly dominant. Another differentiating factor is ethnicity, which strongly matters in Vietnam, where ethnic minority households (H'mong, Tay, Nung, Dao etc.) have considerably lower levels of consumption.

In conclusion, our consumption models largely confirmed the results found when comparing the diversification strategy between the two countries. Considering the different problems in agriculture of remote rural areas suggests different policy needs. For example, while in Thailand social protection may deserve more attention, in Vietnam, infrastructure investments should be a main priority and the government should pay more attention to development needs of ethnic minority households.

Table 4. 4: Effect of diversification on consumption

Independent variables	Thailand		Vietnam	
	Coefficient	Standard error	Coefficient	Standard error
SID_land	0.001	0.003	0.003**	0.001
SID_labor	0.020***	0.006	0.003	0.008
Ethnic	n/a	n/a	0.312***	0.036
Age_hh	0.006***	0.002	0.004**	0.002
School_hh	0.038***	0.006	0.007**	0.004
Hhsize07	-0.141***	0.019	-0.103***	0.017
School_adult	0.007	0.006	0.033***	0.013
Tot_asset07	0.005***	0.001	0.023***	0.002
Mtransport	0.120	0.084	0.143***	0.025
D_ratio	-0.046	0.067	-0.159***	0.034
Diff_hhsize	-0.035*	0.019	-0.036	0.022
Diff_tot_asset	0.004***	0.001	0.020***	0.002
Diff_D_ratio	-0.084	0.057	-0.033	0.073
Shock08	0.018	0.031	-0.044*	0.025
Coastal_Area	n/a	n/a	-0.022	0.049
Lowland_Area	n/a	n/a	0.067	0.050
Buri	0.269***	0.047	n/a	n/a
Ubon	0.146***	0.046	n/a	n/a
_cons	6.127***	0.257	6.318***	0.193
Number of observations	1,968		1,855	

Note: Cluster at commune level

The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively; n/a means not available

Instrument variables: Number of Land Plots and Percentage of household has migrant people in the village

Tests of endogeneity

Ho: variables are exogenous

Vietnam

Robust score chi2(2)   = 9.77 (p = 0.0076)

Robust regression F(2,1855) = 5.198 (p = 0.0056)

Thailand

Robust score chi2(2)   = 19.08 (p = 0.0001)

Robust regression F(2,1968) = 9.75 (p = 0.0001)

Source: Authors calculations based on the DFG survey 2007 and 2008

4.4.3 Impact of diversification on vulnerability to poverty

Table 4.5 shows the results of probit models to assess the possibility of the households in our sample to fall below the poverty line in 2008. We use the same explanatory variables as in the consumption models. Results largely confirmed the findings of the previous models. Land diversification in Vietnam is an effective strategy of reducing future poverty and the same is true about labor diversification in Thailand. Households in both countries with more assets are less vulnerable. The variable, which measures change in assets between two periods, underlines this effect. Likewise, the direction of influence of transportation, ethnicity, dependency ratio, shocks and province differences in Thailand variables are consistent. The opposite is the case for the bigger households. The effect of back migration because of economic slowdown may show up in this result. While in the consumption model (Table 4.4), the change in household size is only significant in Thailand, in the vulnerability model, this is also the case for Vietnam. This suggests that poor households in Vietnam, engaged in often unstable non-farm employment, are more vulnerable to fall into poverty. Education of the household head, which is generally lower in Thailand (Table 4.1) is an important factor as it reduces the vulnerability of the poor households. The same can be said for education for household labor in Vietnam. Likewise, older people in Thailand are more likely poorer than those in Vietnam. Overall, the models strongly suggested that diversification is effective in reducing future poverty. On the other hand, there are a number of factors, based on the control of rural households that can make them fall in poverty.

Table 4. 5: Effect of diversification on vulnerability to poverty

Independent variables	Thailand		Vietnam	
	Coefficient	Standard error	Coefficient	Standard errors
SID_land	-0.006	0.010	-0.009**	0.005
SID_labor	-0.043**	0.017	0.029	0.033
Ethnic	n/a	n/a	-1.019***	0.145
Age_hh	-0.008*	0.004	-0.002	0.007
School_hh	-0.051**	0.020	-0.008	0.014
Hhsize07	0.297***	0.053	0.193***	0.065
School_adult	-0.015	0.020	-0.121**	0.049
Tot_asset07	-0.036***	0.005	-0.095***	0.009
Mtransport	-0.066	0.203	-0.372***	0.099
D_ratio	-0.172	0.187	0.467***	0.132
Diff_hhsize	0.156***	0.049	0.248**	0.097
Diff_tot_asset	-0.035***	0.005	-0.074***	0.009
Diff_D_ratio	0.080	0.145	0.229	0.274
Shock08	-0.034	0.088	0.209*	0.110
Coastal_Area	n/a	n/a	-0.012	0.191
Lowland_Area	n/a	n/a	-0.223	0.197
Buri	-0.677***	0.123	n/a	n/a
Ubon	-0.419***	0.117	n/a	n/a
_cons	0.913	0.716	6.318***	0.193
Number of observations	1986		1,855	

Note: Cluster at commune level

The symbols *, **, and *** indicate that the coefficient is statistically significant at the 10, 5, and 1 percent level respectively; n/a means not available

Instrument variables: Number of Land Plots and Percentage of household has migrant people in the village

Wald test of exogeneity for Vietnam: chi2(2) = 9.62   Prob > chi2 = 0.0081

Wald test of exogeneity for Thailand: chi2(2) = 15.63   Prob > chi2 = 0.0004

Source: Authors calculations based on the DFG survey 2007 and 2008

4.5. Conclusions

This chapter shows that rural households in Thailand and Vietnam used diversification as self- insurance mechanism for ex-post and ex-ante coping. However, the diversification strategy differs in accordance with socio-economic conditions. We found that the rural households in Vietnam, who are confronted with more weather-related shocks and who expect more agricultural risks, tend to grow a higher diversity of crops and have a higher future consumption and lower chance to be poor in the future. Thai households use labor diversification as a coping strategy and households with higher levels of labor diversification are less likely to be poor in the future. The results also partly reflect the differences in economic and institutional conditions in these countries. Households in Thailand are blessed with better non-farm job opportunities on the one hand and have bigger farm sizes as compared to Vietnamese households.

Improving the infrastructure and the access to credit for the households in Vietnam could reduce the negative impact of shocks. In Thailand, however, credit does not seem to be a strong limiting factor for the choice of shock coping strategies. In both countries, land reconsolidation policies could increase the specialization process and the efficiency of resource use.

The findings from this chapter confirmed the initial hypothesis that in both countries, diversification is an important strategy to reduce vulnerability to poverty of rural households. One of the policy implications of these results is that there is a need for better infrastructure in the areas of transportation, and irrigation as well as is there a need for some institutional innovations in the field of microfinance. Undoubtedly, better access to credit could help the farmers in Vietnam to specialize and hereby reduce their vulnerability to poverty. In addition, poverty reduction programs in Vietnam should give more emphasis to ethnic minorities. In Thailand, providing more stable job opportunities as well as improving education and skills of the rural population can help to reduce the vulnerability to poverty since better education will further increase their options for labor diversification.

Chapter 5

The Poverty and Welfare Effects of the Food Price Crisis in Vietnam[21]

5.1 Introduction

From September 2006 to June 2008, the international prices of food commodities increased dramatically to an unprecedented level, higher than the peak in 1995 (see Figure in appendix D). The food price index increased by about 80%, driven mainly by an increase in the cereal prices. Cereal prices increased by 230% while meat prices increased only moderately (12%). The main reasons for these price increases include both supply-side and demand-side factors: (i) an agriculture production shortfall due to bad weather; (ii) an increase in agricultural production costs because of high energy and fertilizer prices as well as high transportation costs; (iii) export bans and speculative activities by India and Vietnam; (iv) the recent increasing demand from India and China due to their economic booms; (v) the panic of the Philippines government and individuals stockpiling food (Ivanic, et al. 2008); (vi) soaring petroleum prices which increased the demand for biofuels produced from food grains and oilseeds (Collins, Mitchell, and Rosegrant; 2008); and (vii) the weak US dollar compared to other major currencies and lower interest rates by Federal Reserve (Frankel 2006, and Calvo 2008). Derek et al. (2008) conclude that the traders' reactions and hoarding by key rice exporters, the low stock of the main four food staples

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[21] This chapter is a revised version of the paper: Tung, D. P., and H. Waibel (2010), "The Poverty and Welfare Effects of the 2008 Food Price Crisis in Vietnam: A Decomposition Analysis". The paper will be submitted to *Food Policy.*

(corn, wheat, rice and soybeans), and the large increase in production of biofuels are the main factors driving the increase in food prices.

The sharp increase in food prices during this time was a major concern of governments and international orgnizations because of fear of social and political instability in developing countries, especially in poor countries who are net food importers. Ivanic and Martin (2008) estimated that an additional 100 million people could fall into poverty. The World Bank (2008) expected an increase in the number of malnourished people by 4.8%. Therefore, at a meeting in Rome (June 2008) the representatives of 180 countries expressed their concern that "... the international community needs to take urgent and coordinated action to combat the negative impacts of soaring food prices on the world's most vulnerable countries and population" (FAO, 2008).

Rising food prices have macro- and micro-economic impacts. While the macroeconmic impacts are much more clear, less is known about the poverty impacts on different types of households (Derek, et al. 2008). Most current papers (Zezza et al. 2008; Dessus et al. 2008; Wodon et al 2008; and Arndt et al. 2008) use simulation methods that are based on Deaton's (1987) approach. These papers show that rising food prices lead to higher poverty because generally net negative impacts on poor consumers dominate net positive impacts on poor producers. Using the same approach, Vu et al. (2011) found that the rising in food prices (mainly rice price) increases the overall welfare of the Vietnamese households but the impacts are complex. These papers are instrumental for identifying vulnerabilies to price changes across countries and sub-national groups (urban/rural; poor/non-poor).

However, the papers listed above: (i) largely concentrated on changes in food prices (mainly on rice price); (ii) assumed that food price increase is homogenous among countries, regions and food items; (iii) were limited to the estimation of the aggregate effect; (iv) assumed that retail food prices are perfectly correlated with farm gate prices; and (v) did not take into account the changes in the prices of the inputs of food production. Therefore, these papers might have overestimated the effects of food prices on net income changes. As

suggested by Derek et al. (2008) the limitations described above demanded that "ultimately, we still need to learn much more about actual price changes, the additional impacts of increased fuel and fertilizer prices, the short- term behavioral responses to rising food price, and about how government policies can influence these outcomes".

This chapter tries to accomodate some of these suggestions by (i) taking into account the increase in food production costs, (ii) seperating the effects among consumers and producers; (iii) taking into account the differences in change between retail and farm gate prices; (iv) using the actual change in food price of different food items between 2006 and 2008; and (v) showing differences among regions in Vietnam. Since data is highly-disaggregated consumption, production, and price data at the household level in the Vietnam Household Living Standard Surveys 2006 and 2008, we can capture households' short-term behavioral responses and estimate the impacts of net food price changes on household welfare and poverty. The chapter uses the decomposition methodology to isolate price and quantity effects on the demand and supply sides for different household groups. The chapter proceedes as follows. In the next section, an overview of agricultural production and the poverty situation in Vietnam is presented. In the section 5.3, the methdology is introduced. Section 5.4 presents the results and in the last section, the paper is summarized, conclusion are drawn and policy recommendations are given.

5.2 Agriculture production and poverty situation in Vietnam

During the past 20 years, Vietnam has shown impressive results in poverty reduction. Figure 5.1 documents the declines in rural, urban, and overall poverty since 1993. Overall the poverty rate fell from 58% in 1993 to 37% in 1998, and then to 14% in 2008.[22] As Ravallion (2001) notes, rapid economic growth is the major factor that delivered this remarkable success. The growth in agricultural productivity and production as a result of the "Doi Moi" policy change in the late

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[22] GSO- VHLSS abstracts, 1993, 1998, 2002, 2004, 2006 and 2008

1980s was the main contributor to poverty reduction during the 1990s (Bales, Phung, and Ho 2001; Ngo 2006).
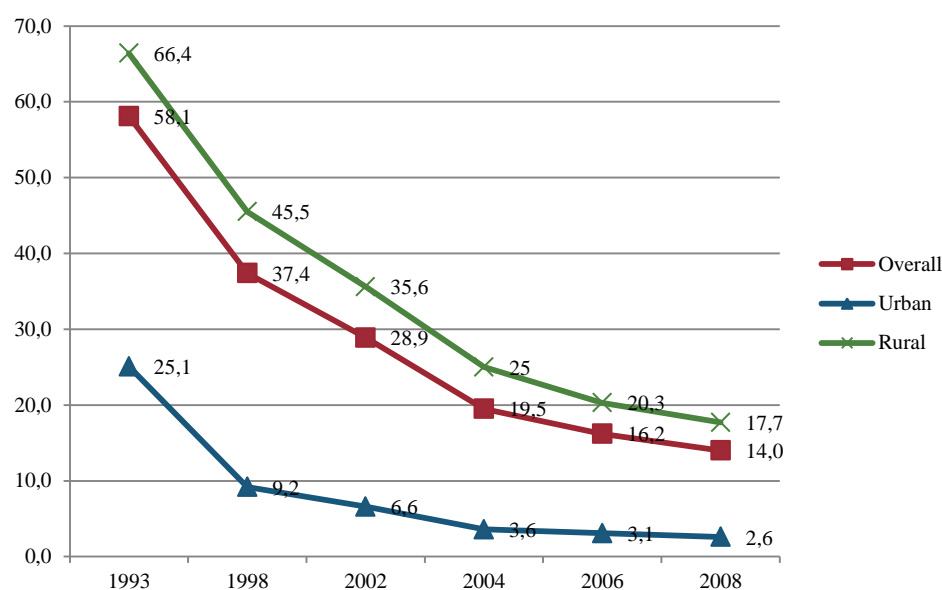
Figure 5. 1: Poverty rates in Vietnam 1993 – 2008

Source: GSO- VHLSS abstracts, 1993, 1998, 2002, 2004, 2006 and 2008

Vietnam, a net rice importer before 1989, became the world's second largest rice exporter by 1998. However, since 2000 the growth rate in the agricultural sector has been declining. Therefore, the rate of poverty reduction has diminished. To date 90% of Vietnam's poor people still live in rural areas and 80% of them are engaged in agricultural production. Income from agricultural activities contributes the largest share to total income. As shown in Figure 5.2, agricultural income accounted for 49% of total income of rural households and 58% of total income of poor rural households in 2008. The agricultural sector in 2008 absorbed about 53% of the rural labor force. This shows that, in spite of rapid industralization, the agriculture sector still plays a decisive role in terms of job and income creation for rural households in Vietnam.
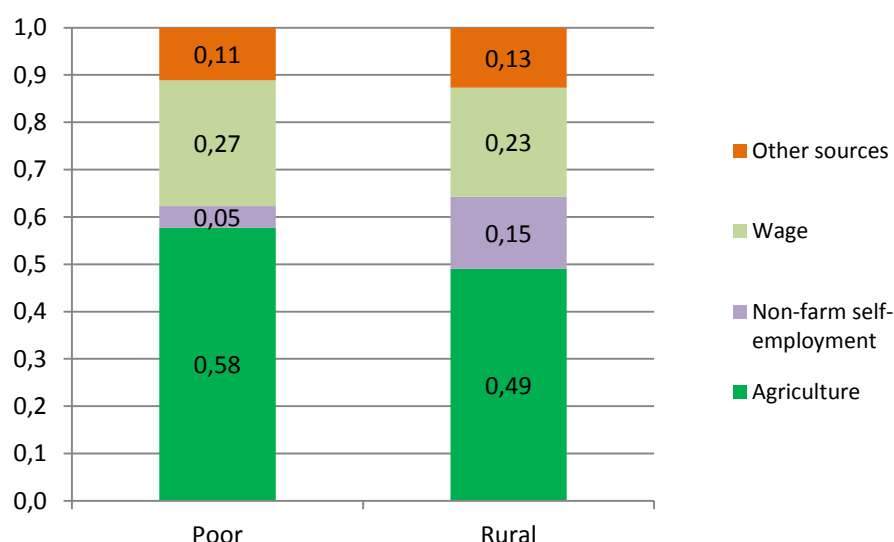
Figure 5.2: Share of household income by source in 2008 for rural households and for households designated as poor.

Source: Author's calculation based on VHLSS 2008

Rice production plays a key role in the agricultural income of rural households. The share of income from rice in total agricultural income of rural households was about 57% in 2008; 74% of the growth in aggregate agricultural income in 2008 is attributable to rice production.[23]

Like other emerging market economies in Asia, Vietnam could not escape from the consequences of the food price crisis. Even with export restrictions on rice applied in January 2008, food prices in Vietnam increased dramatically in concert with international food prices. The food price index increased by about 70% and cereal prices more than doubled from January 2006 to August 2008[24], which is the main reason for the Consumer Price Index (CPI) to reach the highest level that has been observed since the mid 1990s.[25]

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[23] Author's calculation based on VHLSS2008

[24] The depreciation of Vietnam Dong is only 4.8% during January 2006 to August 2008

[25] GSO website (http://www.gso.gov.vn/default.aspx?tabid=393&idmid=3&ItemID=8623)

5.3 Methodology and Data

5.3.1 Methodology

This section presents the methodology to estimate the short-term impacts of rising food prices on welfare and poverty as well as the responses of different household groups to changing food prices on both the demand and supply sides. The methodology used in this chapter is based on the decomposition approach developed by Ravallion and Huppi (1991) for analysis of the Sectoral Decompositions of Changes in Poverty. It adapts this method to measure the effects of food price increase on income and consumption. In the first step, it defines households who are net food sellers and net food buyers. A household is considered to be a net food seller if during a defined period (a year) it produced more food than it consumed measured in value terms. On the other hand, a household is considered to be a net food buyer if it produced less food than it consumed. In principle, a net food seller will benefit from food price increases as long as the revenue increase exceeds any corresponding increase in input costs; the opposite holds true for net food buyers (Brinkmann et al. 2010).

The impact of rising food prices on household welfare can be measured by two criteria, namely household income and household consumption. First, we look at the change in household income. Household income includes food income (*FI*) and non-food income (*NFI*). *FI* includes income from all foods produced by the household; *NFI* includes income from non-food crops, non-farm self-employment income, wage and other income sources (renting, remittances, and other transfers). In this analysis, it focuses on the change in food income, and abstract from any general equilibrium effects (e.g., higher food prices induce increased labor supply, demands for higher wages, etc.). Thus, the change in food income of household *i* between year t_0 and t_n can be expressed as:

$$(1) \quad \Delta FI_i = (FI_{it_n} - FI_{it_0}) = \sum_{j=1}^{m} \left(P_{jt_n}^p Q_{jt_n}^p - P_{jt_0}^p Q_{jt_0}^p \right),$$

where ΔFI_i is the change in income in value terms for foods produced by the household between year t_0 and t_n;

$P^p_{jt_n}$ is the net price of food j that is calculated by subtracting the cost per unit of ouput from the producer price of the product j in year t_n ;

$P^p_{jt_0}$ is the net price of food j that is calculated by subtracting the cost per unit of ouput from the producer price of the product j in year t_0 ;

$Q^p_{jt_n}$ and $Q^p_{jt_0}$ are the output of the food j in year t_n and t_0 , respectively.

This product difference can be decomposed as follows:

$$(2) \quad \Delta FI_i = \sum_{j=1}^{m}(P^p_{jt_n} - P^p_{jt_0})Q^p_{jt_0} + \sum_{j=1}^{m}(Q^p_{jt_n} - Q^p_{jt_0})P^p_{jt_0} + \sum_{j=1}^{m}(Q^p_{jt_n} - Q^p_{jt_0})(P^p_{jt_n} - P^p_{jt_0})$$

The right hand side of equation (2) has three components, namely price change, quantity change and interaction between price and quantity change. This decomposition allows us to look at the change in income due to the change in each component for each individual food item. Disaggregation by the food item level (comodity) is crucial, since changes differ across food items. Input price changes are accounted for in calculating the net prices, i.e farm gate price minus the cost of inputs.

The second channel through which food price changes affect household welfare is through the household consumption bundle. Household consumption expenditures include food consumption (*FC*) and non-food consumption (*NFC*) items. A change in household consumption expenditures can be expressed as:

$$(3) \quad \Delta C_i = (FC_{it_n} - FC_{it_0}) + (NFC_{it_n} - NFC_{it_0})$$

This chapter includes *NFC* for measuring changes in consumption expenditure but it does not account for changes in *NFC* since we are only intested in the effects of food prices. The changes in food expenditure (equation 3) can be divided into two parts:

$$(4) \quad \Delta FC_i = (FC^s_{it_n} - FC^s_{it_0}) + (FC^p_{it_n} - FC^p_{it_0}),$$

where ΔFC_i is household i's change in food consumption expenditure between year t_0 and t_n; $FC^s_{it_n}$ and $FC^s_{jt_0}$ are the food consumption "expendtitures" on self-produced food items (s) in year t_0 and t_n;

$FC^p_{it_n}$ and $FC^p_{it_0}$ are the expenditures on food items purchased (p) in year t_0 and t_n.

Equation 4 can be re-written as follows:

(5) $$\Delta FC_i = \sum_{j=1}^{m}\left(\mathrm{P}^s_{jt_n}Q^s_{jt_n} - \mathrm{P}^s_{jt_0}Q^s_{jt_0}\right) + \sum_{j=1}^{m}\left(\mathrm{P}^{pr}_{jt_n}Q^{pr}_{jt_n} - \mathrm{P}^{pr}_{jt_0}Q^{pr}_{jt_0}\right)$$

$P^s_{jt_n}$ and $P^s_{jt_0}$ are the producer prices for quantities $Q^s_{jt_n}$ and $Q^s_{jt_0}$ of self-produced food items (j) that the household consumed in year t_n and t_0;

$P^{pr}_{jt_n}$ and $P^{pr}_{jt_0}$ are the consumer prices for quantities $Q^{pr}_{jt_n}$ and $Q^{pr}_{jt_0}$ of purchased food items (j) that the household consumed in year t_n and t_0;

Finally, each component of equation (5) can be decomposed into price, quantity and interaction terms (equation 6a & 6b).

(6a) $$\Delta FC^s_i = \sum_{j=1}^{m}(P^s_{jt_n} - P^s_{jt_0})Q^s_{jt_0} + \sum_{j=1}^{m}(Q^s_{jt_n} - Q^s_{jt_0})P^s_{jt_0} + \sum_{j=1}^{m}(Q^s_{jt_n} - Q^s_{jt_0})(P^s_{jt_n} - P^s_{jt_0})$$

(6b) $$\Delta FC^p_i = \sum_{j=1}^{m}(P^{pr}_{jt_n} - P^{pr}_{jt_0})Q^p_{jt_0} + \sum_{j=1}^{m}(Q^{pr}_{jt_n} - Q^{pr}_{jt_0})P^{pr}_{jt_0} + \sum_{j=1}^{m}(Q^{pr}_{jt_n} - Q^{pr}_{jt_0})(P^{pr}_{jt_n} - P^{pr}_{jt_0})$$

The first part of equation (6a & 6b) is the change in household consumption expenditures due to the change in food prices; the second is the change in household consumption expenditures due to the change in the quantity consumed; and the third is the change in consumption due to the interaction between changes in prices and changes in quantities. This approach allows us to account for price changes of all self-produced and purchased food items.

To calculate the household welfare effect, we subtract each component of equation (6a & 6b) to the corresponding component of equation (2) and divide the difference by initial total consumption, i.e. our household welfare indicator. Subtracting the first component of equation (6a & 6b) from the first component of equation (2) gives us the welfare change due to price changes:

(7)
$$\frac{\sum_{j=1}^{m}(P_{jt_n}^{p} - P_{jt_0}^{p})Q_{jt_0}^{p} - [\sum_{j=1}^{m}(P_{jt_n}^{s} - P_{jt_0}^{s})Q_{jt_0}^{s} + \sum_{j=1}^{m}(P_{jt_n}^{pr} - P_{jt_0}^{pr})Q_{jt_0}^{p}]}{(FC_{it_0} + NFC_{it_0})}$$

Subtracting the second component of equation (6a & 6b) from the second of equation (2) gives us the welfare change due to the change in food quantity of production and consumption:

(8)
$$\frac{\sum_{j=1}^{m}(Q_{jt_n}^{p} - Q_{jt_0}^{p})P_{jt_0}^{p} - [\sum_{j=1}^{m}(Q_{jt_n}^{s} - Q_{jt_0}^{s})P_{jt_0}^{s} + \sum_{j=1}^{m}(Q_{jt_n}^{pr} - Q_{jt_0}^{pr})P_{jt_0}^{p}]}{(FC_{it_0} + NFC_{it_0})}$$

Subtracting the third component of equation (6a & 6b) from the third of equation (2) gives us the welfare change due to the interaction between price and quantity of food items.

(9)
$$\frac{\sum_{j=1}^{m}(Q_{jt_n}^{p} - Q_{jt_0}^{p})(P_{jt_n}^{p} - P_{jt_0}^{p}) - [\sum_{j=1}^{m}(Q_{jt_n}^{s} - Q_{jt_0}^{s})(P_{jt_n}^{s} - P_{jt_0}^{s}) + \sum_{j=1}^{m}(Q_{jt_n}^{pr} - Q_{jt_0}^{pr})(P_{jt_n}^{pr} - P_{jt_0}^{pr})]}{(FC_{it_0} + NFC_{it_0})}$$

In the next step, we measure the impact of each above component on poverty. We adjusted each nominator in (7), (8) and (9) by the consumer price index (CPI) and then added the consumption in t_0. We use the FGT (Foster-Gree, and Thorbecke) with α equal 0 (Head Count Ratio) and 1 (Poverty Gap) to measure poverty effects.

(10)
$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - c_i}{z}\right)^{\alpha}$$

where z is poverty line, c_i is the ith lowest expenditure, n is total population, q is number of persons who are poor.

The poverty line used in this paper is the poverty line used by the General Statistics Office and World Bank in Vietnam for the Vietnam Living Standard Survey (VHLSS)[26].

5.3.2 Data

The chapter uses a panel of households from the Vietnam Household Living Standard Surveys (VHLSS) that was collected in 2006 and 2008 by the General Statistics Office with technical assistance from World Bank and UNDP. The VHLSS are conducted bianually since 2000. The VHLSS used 3 questionnaires: a short household questionnaire, a long household questionnaire, and a commune questionnaire. The short questionare was used to collect information from 36,000 households in 3,000 communes (about 1/3 of the communes in Vietnam). It includes information on different household characteristics, including demographics, education, health, income from different sources, borrowing and saving, assets, and participation in the national target programs. The agricultural section in the questionnaire contains detailed information about inputs and outputs for 57 different crops and of 22 different types of livestock. The long questionnaire includes additional information on consumption. Households were requested to report the quantity and value of 57 different self-produced and purchased food items consummed by the households during a reference period of 12 months. This data was collected from 9,000 households in the same 3,000 communes.

Half of the households surveyed with the long and short questionnaires in 2006 were randomly selected to be re-interviewed in 2008. As result, about 4,500

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[26] The main methodology applied to define the poverty line is the basic needs approach: the poverty line is the minimum amount of money needed to obtain a basket of food and non-food items that could provide a minimum caloric requirement per person per day. For Vietnam the WHO defines the minimum caloric requirement as 2100 calories per person per day.

households constitute a panel for the long questionnaire.[27] In this study, we use data from the long questionnaire to evaluate the impact of rising food prices on household welfare as it contains detailed information on both income and consumption.

5.4 Results

5.4.1 Who are the net sellers/ buyers?

Table 5.1 below presents the distribution of net sellers and net buyers for all food items and for rice seperately across regions and level of welfare (poor and non- poor) in 2006. About 80% of net sellers are found in the Red River Delta, the North Central Coast, the Mekong River Delta and the Northeast region. Nearly half of the net sellers lived in the two biggest rice production regions, the Mekong River Delta and the Red River Delta. At the same time, these two regions are also the place where the biggest share of net buyers can be founded. In addition, the Southeast has the highest share of net buyers due to the high density of urban population. Note that there are very few the net sellers in urban areas (5.5%). The share of net sellers who are the poor is the same as the share of them in the population.

The distribution of rice net sellers and rice net buyers is quite similar to the distribution of net sellers and net buyers of all food items. However, the largest share of rice net seller is in the Red River Delta, while the biggest share of rice production comes from Mekong River Delta. The main reason for this difference is that the Red River Delta has larger population but less inequality in land distributionas compared to the Mekong River Delta.

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[27] For detailed information see Phung Duc Tung and Nguyen Phong "Vietnam Household Living Standards Survey (VHLSS) 2002 and 2004- Basic Information" (http://siteresources.worldbank.org/INTLSMS/Resources/3358986-1181743055198/3877319-1207149468624/BINFO_VHLSS_02_04.pdf)

Table 5.1: Share of Net buyer and Net seller

	All foods		Rice only		Share in total population
	Net- buyer	Net- seller	Net- buyer	Net- seller	
Red River Delta	21.7	26.1	16.7	31.5	21.8
Northeast	8.7	15.1	8.1	15.2	11.4
Northwest	1.8	3.7	2.7	2.4	3.0
North Central Coast	11.0	16.8	10.2	17.3	13.3
South Central Coast	9.2	7.9	7.7	9.8	8.6
Central Highland	5.7	4.1	6.0	3.9	5.9
Southeast	22.8	5.3	25.4	3.7	15.9
Mekong River Delta	19.1	21.0	23.2	16.1	20.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Non- poor	87.2	85.7	86.7	86.3	84.4
Poor	12.8	14.3	13.3	13.7	15.6
Total	100.0	100.0	100.0	100.0	100.0
Urban	41.2	5.5	43.5	6.1	27.3
Rural	58.8	94.5	56.5	93.9	72.7
Total	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

Source: Author' calculation based on VHLSS 2006

5.4.2 Impact on the welfare of the prices of all food items

Table 5.2 summarizes the effects of price changes on household welfare through the three components specified in the methodology section, namely price changes, quantity changes, and the interactions of those two. In addition, the total effect for all food items is given. Each component is given as a percentage of the household's initial total consumption. The last column of the table is the percentage of households in each sub-population that experienced increased welfare due to food price increases. Over all, the increase in food prices during the period 2006 - 2008 increased the welfare of Vietnamese households by about

7.5% in real terms. However, the number of people who experienced increased welfare is much smaller than the number of people who experienced welfare reductions (37.4% and 62.6%, respectively).

On average poor and non-poor households both gain but the extent of gain for non-poor household is much larger (8.1% compared to 4.3%). However, the percentage of poor households that enjoyed any welfare gain (46.4%) is larger than the percentage of non-poor who gain. This could be a reflection of the fact that poor people are more engaged in farm activities .

As expected, on average, rural households gained and urban households lost. On average, the welfare of the households living in rural area increased about 12.7% while urban households lost about 8.0% of their welfare due to food price increases. However, not all rural households were better off, nor were all urban households worse off. Among rural households, 46.2% were better off, while only about 10.7% of the urban households actually gained from rising food prices. The main reason for this is that some places that are designated as urban still have farming households.[28]

The picture that is found at the regionl levels is quite striking. Four regions suffered reductions in welfare on average and four experienced increases. However, there is only one region that experienced substantial welfare gain, the Mekong River Delta as the country's major rice producing region. In the Southeast region, which includes Ho Chi Minh City, the share of household who are better- off is lowest and the share of households who suffer from welfare loss is highest. This can be partly explained by the high level of urbanization. The Northwest and Red River Delta regions also experience negative overall impacts of food price on welfare. The Northwest region is the poorest region in Vietnam. It is not a major rice producer and often has to import rice from other regions. In addition, the Northwest has poor infrastructure for irrigation and transportation. Consequently, cost of transportation and inputs are high. The Red

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[28] For the definition of urban, see "Decision No 72/2001/NĐ-CP dated 5th October 2001 of the Prime Minister."

River Delta, which includes the Capital Hanoi is also worse off on average for the same reason as the Southeast.

Table 5. 2: Impact on the welfare of the household (% of consumption per capita 2006)

	Price effect	Quantity effect	Interaction effect	Total effect	Percentage of better- off
Poor in 2006	4.3	-8.3	9.5	5.5	46.4
Non- poor in 2006	8.1	-2.0	0.4	6.5	35.3
Urban	-8.0	1.2	0.3	-6.5	10.7
Rural	12.7	-4.4	2.4	10.7	46.2
Red river delta	5.2	-3.4	-4.2	-2.4	39.8
Northeast	0.5	-2.0	3.2	1.6	41.8
Northwest	-7.9	0.2	5.7	-2.0	35.6
North Central Coast	7.0	-7.8	5.1	4.3	48.6
South Central Coast	3.2	-3.5	5.2	4.9	37.4
Central Highland	5.4	-5.5	-0.1	-0.2	39.6
Southeast	-2.9	-4.0	2.9	-4.0	15.9
Mekong River Delta	27.1	1.3	3.5	31.9	40.7
Quintile 1	7.0	-7.5	8.6	8.1	48.5
Quintile 2	15.0	-4.1	-0.2	10.7	45.4
Quintile 3	11.2	1.6	-2.8	10.0	44.2
Quintile 4	4.0	-1.8	2.0	4.2	30.1
Quintile 5	-0.8	-3.5	2.2	-2.2	15.6
Total	**7.5**	**-3.0**	**1.9**	**6.3**	**37.2**

Source: Author' calculation based on VHLSS 2006 & 2008

The lower panel of Table 5.2 shows how the impacts of increasing food prices are distributed across quintiles of per-capita household consumption. Poor people often work in the agricultural sector. Therefore, show higher share of agriculture households in the low quintiles. This shows an inverse U-shape relationship between the welfare gain due to the food price changes and the initial level of income with the highest average gain enjoyed by middle-income group. Not surprisingly, the richest households (quintile 5) experienced welfare losses as

most of them are non-agricultural households. Their losses however rather seem insignificant in relative terms as suggested by Engel's law. The quantity and the interaction effects are relatively small compared to the price effect in the non-poor group. However, these effects are large in the poor group and are mainly driven by the responses of poor households on the demand side.

5.4.3 Impact on poverty of price changes of all foods

Impact on headcount index

The rise in food prices increased the poverty rate in Vietnam by 2.5 percentage points and increased the poverty in both urban and rural areas as shown in Table 5.3. The poverty rate in net seller group was only reduced by 3.2 percentage points while it increased the rate of the net buyers by 7.1 percentage points. Also the share of net sellers is smaller than the share of net buyers. A much higher number of net buyers in rural areas fell into poverty due to rising food prices than those living in urban areas (10.1% and 2.8%, respectively). This reflects the fact that the level of welfare of most net-buyer households (measured by consumption) is close to the poverty line. Moreover, as Brandt (2006) shows, rural households close to the poverty line have less land to farm; this observation is particularly prominent for the Mekong River Delta.

Price effects have led to an increase in poverty rates in most regions. There are only two regions (North Central Coast and Central Highland) where poverty has decreased (-2.5 and -1.9 percentage point, respectively). Poor people in these regions are mostly net sellers of food and are mainly engaged in rice production. In addition, as mentioned in Section 4.1, these regions are net rice importers. The net sellers in these regions benefitted more from higher rice prices, compared to net sellers in the Mekong River Delta because they bear lower transportation and transaction costs. As a result, poverty rate of net sellers fell by more than 10 percentage points. The number of net buyers who emerged from poverty is much larger than the number of net buyers who fell into poverty.

The most negatively affected regions are the Mekong River Delta, the Northwest region, and the Southeast region: in these regions the poverty rates increased by

more than 4 percentage points. This confirms the findings of Vu et al (2011). While the latter two regions are net food importing regions due to the high share of urban population (Southeast) and the poor conditions for agriculture (Northeast), the Mekong River Delta, which produces 90% of the rice in Vietnam, did not enjoy a decrease in the poverty rate. This could have several reasons. First, and most importantly, most poor households in the Mekong River Delta are net buyers. Also the Mekong River Delta has the biggest share of landless households in Vietnam who mainly work as wage earners in the agriculture sector. Ravallion (2006) showed that the percentage of landless households in this region was 25% while the national average was only 13.5% in 2004. The second reason is that poor and near-poor households who are net sellers are unable to store rice during the harvest time due to poor infrastructure, bad housing conditions, and flooding that often affect the summer crop season. Consequently, the smaller and poorer households often have to sell all of their products to intermediaries or traders right after the harvest. This also explains the big gap between producer and retail prices of rice. Hence, most of the gain from rising food prices goes to large farmers and traders. The difference between the producer price and retail price of rice in Mekong River Delta increased from 1.56 times in 2006 to 2.3 times in 2008.[29]

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[29] Author's calculation based on VHLSS 2006 and 2008

Table 5. 3: Poverty rate by 8 regions (%)

	Net- seller		Net- buyer		Over all	
	Poverty rate 2006 (%)	Percentage point change in poverty due to price increase (%)	Poverty rate 2006 (%)	Percentage point change in poverty due to price increase (%)	Poverty rate 2006 (%)	Percentage point change in poverty due to price increase (%)
Urban	14.0	-3.1	2.5	2.8	3.6	2.4
Rural	24.4	-3.3	14.8	10.1	20.3	2.5
Red River Delta	16.5	-1.2	2.7	5.0	9.3	2.0
Northeast	30.9	-1.5	13.3	6.2	24.0	1.6
Northwest	58.8	2.6	32.7	8.9	50.6	4.6
North Central Coast	34.3	-10.4	23.3	7.6	29.5	-2.5
South Central Coast	18.8	-5.5	8.0	9.1	12.4	3.2
Central Highland	55.3	-10.5	13.4	3.6	29.7	-1.9
Southeast	10.9	0.2	4.9	4.8	5.8	4.1
Mekong River Delta	8.7	-0.7	11.9	12.2	10.4	6.1
Total	**23.9**	**-3.2**	**9.8**	**7.1**	**16.1**	**2.5**

Source: Author's calculation based on VHLSS 2006 & 2008

Impact on the poverty gap

The poverty gap is defined as the average of the difference between the consumption level of the poor households and the poverty line. Our result shows that the rise in food prices not only increased the number of people falling into poverty but it also increased the poverty gap. Figure 5.3 shows the poverty gap in 2006 and for those households that remain poor after the food price increase. The poverty gap increased in all regions as a consequence of increased food prices; most severely affected where those in the Northwest, Mekong River Delta, and Northeast regions. In these regions, the effect on the head count index was also highest. Poor households who are net buyers (Figure in Appendix E) suffer most from the food price increase, dramatically increasing their poverty gap. On

average, the poverty gap more than doubled in this group. The level of impact was highest in the Mekong River Delta, where the poverty gap of net buyers increased more than 4 times. However, the most seriously affected poor people were the net buyers in the Northeast where initial poverty gap is highest.
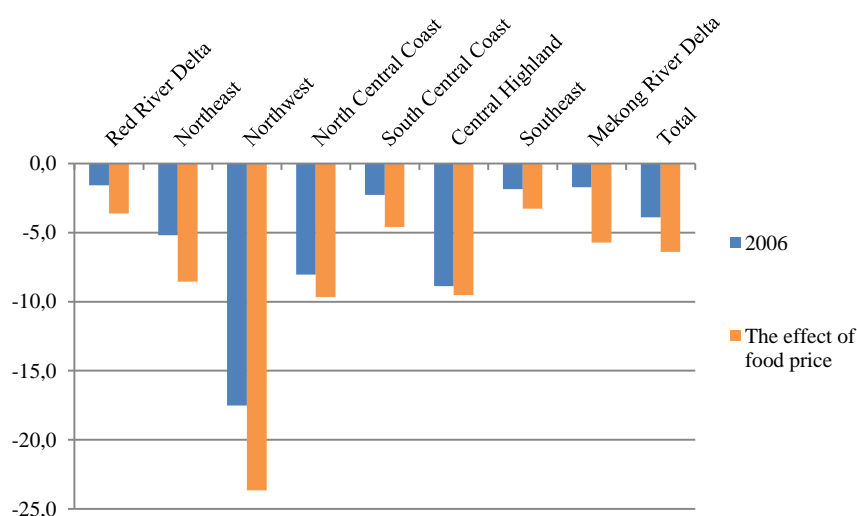
Figure 5. 3. Impact of the food price increase on poverty gap

Source: Author's calculation based on VHLSS 2006 & 2008

5.4.4 Impact of rice price

Rice income has the highest share (more than 50%) of total agricultural income of the households in 2006; it is the major crop produced and consumed by the poor. Rice price increased most among all food items between 2006 and 2008. In this section, we examine the short-term impact of the rice price increase on welfare and poverty of the households in different regions and different income groups.

Impact on the welfare

Table 5.4 shows that, on average, the welfare gain from rice price increase was 8.8%, which is larger than the impact of price changes of all food items (7.5%). This can be explained by the role of the livestock prices. During 2006 - 2008, the

producer price per kilogram of livestock increased by 57% while the production cost per kilogram increased by 108%[30].

On average, the increase in rice prices increased the welfare of both poor and non-poor households. However, both, the extent of the gains and the percentage of households that enjoyed gains were larger among non-poor households than among poor ones. As expected, urban households lost and rural households gained in welfare. However, only 52% of rural households actually gained from the rice price increases.

Average welfare increased in six regions. The Mekong River Delta enjoyed the largest average welfare gain of about 24% due to high share of large farmers. Similar to the situation with overall food price, households living in the Northwest suffered the largest average welfare loss (-4.4%). Only 36% of the households living in this region gained due to the rice price effect. The North Central Coast, Red River Delta and Northeast had the highest percentages households who gained due to the effect of rice price increases (58.4%, 55.3% and 54.7%, respectively).

The equity effect followed those found for the result of overall food prices. Households who gained most belonged to the second and third quintiles of the distribution of per-capita household consumption and the percentage of better-off households decreased by quintiles. Thus, the increase in rice price favored the middle-income groups. The quantity and interaction effects are much smaller than the price effect; and they are mainly driven by adjustments in consumption.

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[30] Author's calculation based on VHLSS 2006 and 2008

Table 5. 4: Impact on the welfare of the household (% of consumption per capita 2006)

	Price effect	Quantity effect	Interaction effect	Total effect	Percentage of better- off
Poor in 2006	7.8	0.6	3.2	11.7	39.3
Non- poor in 2006	9.0	1.1	2.3	12.5	53.0
Urban	-1.0	-0.1	0.2	-0.8	9.5
Rural	12.1	1.4	3.2	16.8	52.3
Red river delta	8.4	-0.2	1.1	9.3	55.3
Northeast	4.6	0.8	2.0	7.4	54.7
Northwest	-4.4	-2.6	3.3	-3.7	33.7
North Central Coast	11.3	0.9	2.3	14.5	58.4
South Central Coast	4.4	0.2	3.6	8.3	44.2
Central Highland	2.4	0.6	1.4	4.4	27.3
Southeast	-1.6	0.9	1.5	0.8	11.5
Mekong River Delta	24.0	3.8	4.9	32.7	35.9
Quintile 1	9.2	1.0	3.7	13.8	55.2
Quintile 2	12.4	2.9	4.3	19.6	56.6
Quintile 3	12.1	0.3	2.5	14.9	48.3
Quintile 4	7.2	1.5	1.4	10.2	31.7
Quintile 5	2.3	-0.5	0.2	2.1	13.1
Total	**8.8**	**1.1**	**2.5**	**12.3**	**41.5**

Source: Author' calculation based on VHLSS 2006 & 2008

Impact on headcount ratio

Rice price effect decreased the poverty headcount ratio by 1.5 percentage points (Table 5.5), with 2 percentage points in rural and 0.3 percentage point in urban areas. Nearly one-third of the poor net sellers were able to escape from poverty. However, poverty among net- buyers increased by 3.1 percentage points. The poverty rate of the net seller group decreased sharply in the North Central Coast, South Central Coast, Central Highland, and Red River Delta, while the poverty

rate of the net buyer group increased dramatically in the Mekong River Delta. Thus, the largest poverty rate reductions due to increasing rice prices occurred in the North Central Coast and Red River Delta. In absolute terms, in the Mekong River Delta, Northwest, and Southeast regions less people escaped from poverty than those falling into poverty.

Table 5. 5: Poverty rate by eight regions (%)

	Net- seller		Net- buyer		Over all	
	Poverty rate 2006 (%)	% point change in poverty due to rice price increase (%)	Poverty rate 2006 (%)	% point change in poverty due to price rice increase (%)	Poverty rate 2006 (%)	% point change in poverty due to price rice increase (%)
Urban	14.0	-4.1	2.5	0.7	3.6	0.3
Rural	24.4	-7.2	14.8	4.8	20.3	-2.0
Red River Delta	16.5	-9.6	2.7	0.3	9.3	-4.4
Northeast	30.9	-6.8	13.3	4.4	24.0	-2.3
Northwest	58.8	6.2	32.7	2.8	50.6	5.1
North Central Coast	34.3	-13.6	23.3	5.0	29.5	-5.4
South Central Coast	18.8	-10.0	8.0	2.0	12.4	-2.8
Central Highland	55.3	-9.7	13.4	0.5	29.7	-3.5
Southeast	10.9	-0.2	4.9	1.7	5.8	1.4
Mekong River Delta	8.7	-2.6	11.9	7.7	10.4	2.9
Total	**23.9**	**-7.1**	**9.8**	**3.1**	**16.1**	**-1.5**

Source: Author' calculation based on VHLSS 2006 & 2008

Impact on the poverty gap

The increase in rice prices increased the poverty gap in both urban and rural areas, as is seen in Figure in the appendix F. The poorest households are most severely affected. On average, poverty gap increased by 0.6 percentage point and the impact on the urban poor was smaller than on the rural poor.

The impacts of the rising rice prices on the poverty gap are different among the eight regions of Vietnam (see Figure 5.4). In most regions, the poverty gap increased; the exceptions were the Red River Delta, the Northeast, and the North Central Coast. We found that in regions where the poverty headcount increased, the poverty gap is also increased. The rising rice prices had mixed effects across regions, while welfare of the poor improved in some regions, the situation became worse in others, hence regional inequality increased.
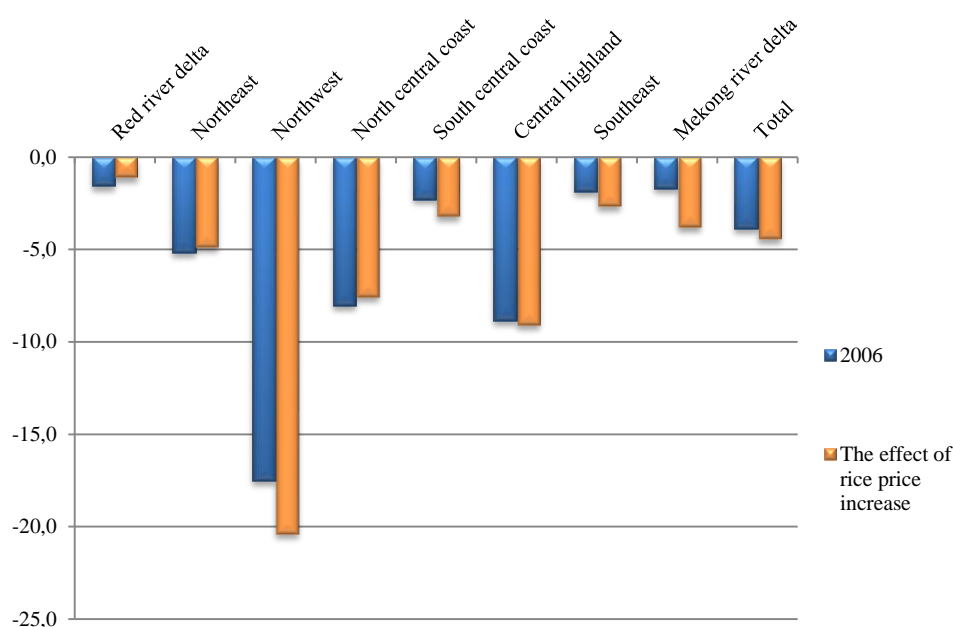
Figure 5. 4. Impact of rice price increase on poverty gap

Source: Author's calculation based on VHLSS 2006 & 2008

5.5 Summary and Conclusions

Applying a decomposition method to a panel data set of the Vietnam Living Standard Survey 2006 (ex-ante) and 2008 (ex-post), this chapter examines the short term impact of actual food and input price changes on welfare and poverty of different household groups in different geographic regions in Vietnam to the 2008 food price crisis. In addition, the chapter also takes into account the change in input prices on the change in welfare and poverty. The chapter showed that on average, the rise in food and input prices had increased welfare of households in Vietnam by 7.5%. These results are strongly driven by the impact of the rice

price. It is important to note that the percentage of households who gained is lower than households who suffered welfare losses. The distribution effect of the food price increase was negative because of poor households lost and the middle income household gained and it confirms the findings of Vu et al 92001) who were applying the Deaton's approach.

Also the poverty effect is negative as the welfare of people living below the poverty line decreased further. This confirms the findings of Voelker et al. (2011) who were using a mathematical modeling approach to assess the effect of the food price crisis on poor households in mountainous areas of the Central Highlands of Vietnam. On the other hand, the increase in rice price helps to reduce the poverty headcount by 1.5% point. However, the extremely poor were negatively affected as poverty gap increased. The impact on poverty varied strongly by region. Poor people living in Northwest, Mekong River Delta and Southeast were most affected from the rise in food prices.

The chapter confirmed the assumption made by other authors dealing with this topic that the reaction of the producer on the supply side and consumer on the demand side is only moderate. However, it found that the reaction among poor consumers was stronger. They substituted high quality and foods that are more expensive by low quality and cheaper food items. In addition, we find considerable difference between rice, livestock products and other food items. Most importantly, cost of production increase was found to be highly variable among households in different regions. This supports the assumption that previous papers in the literature may have overestimated the impact of the food price on food supply and welfare.

That chapter allows some policy conclusions. First due to the high variation in the effect of food price increases across regions and types of households, the targeting of support measures to mitigate the negative effect becomes an issue. Simple targeting by income and geographic criteria would be neither effective nor efficient. Second, some of these variations are caused by structure conditions, especially in rural areas (e.g. infrastructure, inequality in access to land and other resources, market imperfection). Therefore, reducing the impact

of possible future negative effects of food price crises can be only achieved if those structure problems are given more serious attention.

Further research to look at the long-term effect of the food price crisis (natural resource, input intensity with implication for environment, malnutrition and health) could provide useful additional information for designing effective policy measures.

Chapter 6

Discussion and Conclusions

The aim of this thesis was to contribute to research that can advance the measurement and assessment of vulnerability to poverty in rural areas of emerging market economies in South East Asia. In terms of specific topics, this research has concentrated on three parts.

First, in chapter two, a study on the data quality issues related to the collection of data for vulnerability to poverty assessments in developing countries. This research is identifying the factors that can lead to non- sampling errors. The empirical basis for this analysis is two rural household surveys in Thailand and Vietnam conducted in 2007 and 2008.

Second, the topic of diversification as a coping to covariate shocks and risks. In this part of the research, the role of diversification and its effect on future household consumption and vulnerability to poverty of rural household was evaluated. This research was split in two sections: a) the analysis for rural households in Vietnam (chapter three) and b) a comparison with households in Thailand (chapter four).

Third, the research was looking at a particular type of shock that has occurred on the global namely the 2008 food price crisis. The study has analyzed the impact of this shock on welfare and poverty of different household types in different regions in Vietnam. The data used for this topic are from the Vietnam Household Living Standard Survey (VHLSS) 2006 and 2008.

This last chapter presents a synthesis of the four preceding chapters and draws some overall conclusions and recommendations.

6.1 Key findings and conclusions

This section presents in brief the key findings of chapters 2-5 and the conclusions that can be drawn with regards to the specific research objectives mentioned in chapter 1. The first objective was stated as:

To analyze the sources of non-sampling errors in rural household surveys for vulnerability assessment and to identify the factors that affect such errors including their effect on consumption. The results will help to improve organization and management in order to improve data quality of the additional panel waves and similar type of surveys in developing countries.

Chapter 2 examines the non- sampling error and the factors that affect this error using data from the rural household survey conducted under the DFG-FOR 756 project. The research considers the number of missing values, the number of "no" or "don't know" answers and the number of violation with plausibility checks as the indicators of non-sampling error. Results show that there are no significant differences between key indicators estimated from the survey data and the data used for sampling selection. However, the differences in the mean of these indicators are wider along with time difference in data collection between survey and the sampling frame. A number of lessons can be learned from this analysis. One is that in longitudinal surveys conducted over a longer period of time the rapid population movement due to migration in both Thailand and Vietnam must be taken into account to ensure that the migrant households or the migrant household members can be captured and then the coverage error could be controlled. Another one is that the non-sampling error is affected by interview environment, interviewer and respondent characteristics, and their interaction. The results show that the length of interview, seasonality problem, the time of interview (morning, afternoon, evening) play important roles in determining the number of missing values and measurement errors. In addition, observing interviewer characteristics can help to significantly reduce non- sampling error.

For example, if interviewers are male, if they come from the areas where the interview is conducted and if they are of mid- age interviewer (not too young, not too old) tends to lower non- sampling error. Other factors that need to be taken into account for selecting the right respondent for interview to reduce non- sampling error are the respondent characteristics, including the age, sex, education, ethnicity and relationship with household head. The study has shown that in cross-country household surveys sampling design must recognize the specific country situation. As much as possible the most up to date sampling frame should be used in order to minimize missing units of the target population. In addition, for vulnerability assessments in Thailand and Vietnam where migration plays an important role, simultaneous surveys of rural household and corresponding migrants should be carried out. The study offers some practical recommendations how the non-sampling error in surveys aimed to collect data for vulnerability assessments can be reduced. These include a) limiting the duration of the interview, b) selecting the suitable time for the fieldwork (e. g. avoiding harvested time, evening) c) selecting interviewers with knowledge of local culture, customs and survey location. It is also recommended to consider age and position when choosing the respondent for the survey and rather move the interview to another time in case the selected respondent is unavailable.

The second objective addressed in chapter 3 "Diversification in response to shocks among farmers in Vietnam" and chapter 4 "Diversification and Vulnerability to Poverty" was:

To identify the role of covariate shocks and risks on the land and labor diversification of the rural households in Vietnam and Thailand and to measure the impact of land and labor diversification on the future welfare and vulnerability to poverty of the households

Chapter three focuses on analyzing the impacts of covariate shocks and risks on the household's portfolio diversification in Vietnam, which is considered as one of the most affected countries by climate change and nature disasters as well one of the countries with the most rapid integration in to the world market. The rural households in Vietnam are more specialized in agriculture production and

therefore the land diversification is at moderate level. In addition, the covariate shock is widespread in Vietnam. There are about 60% of the households experienced with at least one covariate shock in the past 5 years. Chapter 3 also found that the households in Vietnam used land diversification as the main coping strategy. These households allocate land into different crops and balance the land size for each crop. While land diversification is statistically significant for both ex-post coping and ex-ante risk management, diversification in labor is statistically significant only in high-risk averse households. This phenomenon is partly explained by the location characteristics in the surveyed provinces. These provinces belong to the poor regions in Vietnam where the non-farm labor market is underdeveloped with few non- farm job opportunities. Apart from shock and risk factors, there are other important drivers of labor and land diversification such as access to credit, education, infrastructure, irrigation and land fragmentation. The government should increase public investment (infrastructure, credit) and facilitate land reconsolidation programs to accelerate household diversification.

Chapter 4 examines the impacts of covariate shocks and risks on the household's portfolio diversification in Thailand and Vietnam and the effects of these diversifications on household welfare and vulnerability to poverty. This chapter also focuses on measuring the impacts of covariate shocks and risks on land and labor diversification. For both countries, land and labor are the two major production assets of the rural households. The results show that farmers in Vietnam tend to diversify more in crop production than those in Thailand. The difference in labor diversification in two countries is moderate and the intensity is higher in Thailand. These patterns accurately reflect the differences in the socio-economic and institutional conditions of two countries. The living standard of the households in Thailand is higher than that in Vietnam; Thailand also experiences a lower poverty rate. The number of households affected by covariate shocks in Vietnam is higher than that of Thailand, especially in terms of the shocks related to natural disasters. Nevertheless, Thai households are more disposed towards preparation and expectation of external shocks than Vietnam households are. The regression analysis confirms that rural households in both

countries used diversification as self-insurance mechanism for ex-post and ex-ante coping. However, the diversification strategy differs in accordance with socio-economic conditions in each country. The rural households in Vietnam, are more strongly affected by weather-related shocks and thus tend to allocate their land to more crops. Households with better diversification strategy are more likely to enjoy higher future welfare and are less likely to fall into a poverty trap.

Thai households allocate their labor resources into different sectors. Households with higher levels of labor diversification are less likely to be poor and enjoy higher consumption in the future. The findings partly reflect the differences in economic and institutional conditions in both countries. Households in Thailand have a higher chance of working in the non-farm sector and have bigger farm sizes as compared to Vietnamese households. The findings from this chapter confirmed the initial hypothesis that in both countries diversification is an important strategy to reduce vulnerability to poverty of rural households. Ultimately, the diversification strategy depends on the specific characteristics of each household as well as the location factors.

The third objective addressed in chapter 5 "The Poverty and Welfare of the Food Price Crisis in Vietnam" was:

To explore the impact of food price crisis on the household welfare and poverty of the different household groups in different regions in Vietnam in 2008

Chapter 5 examines the impact of net food price changes on the welfare and poverty and the short-term behavioral responses to the rise in food prices for different household groups in different geographic regions in Vietnam applying a decomposition approach and using the VHLSS data of 2006 and 2008. This chapter showed that even though Vietnam is one of the biggest agricultural exporters in the world, the increase in food prices did not benefit the entire population, particularly not the poor households who are mainly engaged in the agriculture. In addition, those who benefited is mainly located in the two biggest rice production regions (Red River Delta and Mekong River Delta). However, on average, the rising food price increased the welfare of the households in Vietnam

mainly due to the impact of the rise in rice price. The percentage of better-off is lower than that of the worse-off. The negative impact of rising food prices is evident in the reduction of the poor's welfare. The rise in food price not only increased the number of poor people but also reduced the welfare of the existing poor. Even though the rise in rice price reduced the poverty headcount ratio by 1.5% points, the crisis reduced the living standard of the people remaining in poverty. The impact on poverty also varies by region. Poor households living in Northwest, Mekong River Delta and Southeast are the most affected group of the rise in food price. The findings also confirmed the assumption of recent papers that the reactions of the both supply and demand sides stay at moderate level. However, poor consumers reacted strongly to the food price crisis. This group moved substantially from high quality and expensive foods into low quality and cheaper foods. In addition, the chapter shows that the price movements of the food items are heterogeneous among the households as well as among the food items. The cost of production are also highly correlated with the food price and vary among households in different regions. Therefore, there is a possibility that in recent papers the impact of the food price on the income of the net sellers may have been overestimated.

6.2 Policy implications

This section derives some policy implications that emerge from the findings of chapters two to five. It first gives policy implications for implementing the household surveys in Vietnam as well as in other developing countries. Second, the policy implications of the risks faced by rural households in relation to Vietnam's rapid world market integration are shown. Finally, policy recommendations are derived from the analysis of the 2008 food price crisis.

Perhaps even more than other developing countries, Vietnam is conducting many surveys. These surveys often comprise large samples using the population censuses as sampling frame. Therefore, the sampling frame cannot be regularly updated. Also large countrywide surveys require a large number of interviewers (i.e. three thousand interviewers for the VHLSS). In addition to that, the

population in Vietnam is highly diverse. In total, Vietnam has over 50 different ethnicities with different culture, custom, and languages living across the country. As result, the implementation and the quality insurance of such surveys pose a big challenge for research and policy institutions that are charged with such surveys. The results of chapter two provide some insights for improving the quality of household surveys in Vietnam. It is recommended to carefully consider the trade-off between sampling error and non- sampling error in defining the sample for household surveys. In addition, it is necessary to identify and evaluate the non- sampling error arising from the different sources, including the sampling frame, migration issues in longitudinal panel surveys, culture and custom factors, and the agricultural production cycle. The survey management process needs to ensure quality control, and maintain motivation both for respondents and interviewers as well as the language used during interviews.

The swift integration into the world market and the lack of an agriculture insurance system has exposed Vietnamese rural households to covariate shocks and risks. The analysis shows that the diversification strategy used by rural households in Vietnam helps them to reduce the vulnerability to poverty. However, for many rural households the possibility to cope with shocks is very limited. Therefore, in rural areas in Vietnam, there is a need for more investment in infrastructure, especially in irrigation, and the enhancement of credit access. In addition, the land reconsolidation program needs to speed up in order to increase the possibilities of increasing efficiency of crop production as widespread land fragmentation in Vietnam is a major barrier for obtaining economies of scale in agriculture. The analysis has shown that the land consolidation program should take into account the regional heterogeneity in the state of development and the degree of poverty.

The comparison between Vietnam and Thailand also allows interesting policy conclusions. The current high rate of transient poverty in Vietnam questions the effectiveness of land diversification as a successful coping strategy of Vietnam and asks the question if a labor diversification strategy as applied in Thailand would not be more effective. It is recommended that the Vietnamese government

should help to increase access to the non-farm labor market for rural labor. This also requires investment in education and qualification, which is needed to satisfy the demand for skilled laborers. Another recommendation is that in Vietnam more needs to be done to reduce poverty among ethnic minority households as poverty remains high among these groups.

During the first half of 2008, international food prices increased dramatically to an unanticipated level. The study shows that Vietnam has gained and lost from this development. While exporters of agricultural products could benefit from the price increase, purchasing power of Vietnam households declined due to rising domestic food price. Large-scale farmers in the Mekong River Delta have benefited from the price hike, while the food price crisis has aggravated the situation of small-scale farmers with considerable variation among geographical regions. Therefore, apart from promoting agricultural exports, policy makers should pay more attention to the vulnerable groups such as agricultural wage earners and small-scale farmers, particularly those belonging to the ethnic minority households who are net buyers of food. The government should promote infrastructure investment, particularly for roads, transportation routes and enhance the trade system in remote areas in order to reduce price inequality in food and agriculture product inputs among geographical regions.

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Appendices

Appendix A: Determinant of number of violations with plausibility check

	Model 4	Model 5
	Coef/se	Coef/se
Log of interview duration (minute)	1.227***	1.199***
	(0.193)	(0.196)
Interview in morning (based is evening)	0.264	0.281
	(0.311)	(0.311)
Interviewed in the afternoon (based is evening)	0.215	0.215
	(0.311)	(0.311)
Interview in the harvested time (dummy)	0.444***	0.442***
	(0.101)	(0.102)
Sex of interviewer (1=male, 0=female)	-0.297**	-0.312**
	(0.139)	(0.141)
Age of interviewer (year)	0.048	0.049
	(0.048)	(0.048)
Square age of interviewer	-0.001	-0.001
	(0.001)	(0.001)
Local interviewers (1=yes, 0=no)	-0.413***	-0.411***
	(0.136)	(0.137)
Sex of respondent (1=male, 0=female)	-0.023	-0.023
	(0.143)	(0.145)
Ethnicity of respondent (Kinh & Thai =1)	0.615***	0.612***
	(0.152)	(0.153)
Age of respondent (year)	0.044**	0.045**
	(0.022)	(0.022)
Square age of respondent	-0.000**	-0.000**
	(0.000)	(0.000)
Respondent education (years in school)	-0.196***	-0.201***
	(0.040)	(0.041)
Square respondent education	0.020***	0.021***
	(0.003)	(0.003)
Respondent is household head (1= yes)	-0.038	-0.042
	(0.131)	(0.132)
Interviewer and respondent are same gender (1=yes)	-0.087	-0.097
	(0.196)	(0.198)
Number of household' labor	0.013	0.014
	(0.029)	(0.029)
Total agricultural land	-0.000	-0.000

	Model 4	Model 5
	Coef/se	Coef/se
	(0.000)	(0.000)
Household size (person)	0.163***	0.166***
	(0.027)	(0.027)
Thailand (1=yes, 0=otherwise)	-0.163	-0.143
	(0.120)	(0.121)
_cons	-5.821***	-5.725***
	(1.420)	(1.430)
Number of observations	3,988	3,913
Survey team fixed effect	No	Yes
Adjusted R2	0.069	0.076

*Note: *** p<0.01, ** p<0.05, * p<0.1*

Appendix B: Shock distribution among three provinces

Type of Shock	Ha Tinh	Hue	Dak Lak	Total
Illness of household member	35.0	21.2	43.8	100.0
Death of household member	46.5	17.1	36.4	100.0
Household member left the house	37.4	11.4	51.3	100.0
Person joined the house	15.9	26.3	57.8	100.0
Money spent for ceremony	36.9	19.7	43.5	100.0
Household Damage	33.2	5.9	60.9	100.0
Theft	32.4	23.1	44.5	100.0
Conflict with neighbor	13.0	21.9	65.0	100.0
Relatives/Friends stop sending the money	0.0	46.5	53.5	100.0
Flooding	40.5	27.9	31.6	100.0
Drought	6.3	2.8	90.9	100.0
Unusually heavy Rainfall	13.0	81.3	5.7	100.0
Crop pests	27.4	9.7	62.9	100.0
Storage pests	0.0	81.2	18.8	100.0
Livestock Disease	50.3	10.4	39.3	100.0
Landslide, Erosion	0.0	100.0	0.0	100.0
Job Loss	31.61	17.16	51.24	100.0
Collapse of business	40.19	19.19	40.62	100.0
Unable to pay back loan	34.98	15.76	49.26	100.0
Strong increase of interest	0	0	100	100.0
Strong decrease of price of output	1.07	0.9	98.02	100.0
Strong increase of price of input	0	0	100	100.0
Be in debt	75.18	24.82	0	100.0
Be in jail	31.89	3.98	64.13	100.0
Lack of farm land	0	0	100	100.0
Was cheated	80.82	0	19.18	100.0
Work abroad	100	0	0	100.0
Traffic accident	69.43	9.18	21.39	100.0
Storm	7.13	92.87	0	100.0
Built the house	37.56	12.08	50.36	100.0
Other	64.53	9.51	25.97	100.0
Total	28.86	18.59	52.54	100.0

Source: Author's calculation based on the data of the first survey in 2007 of the DFG project

Appendix C: Shock distribution in three provinces

Type of Shock	Ha Tinh	Hue	Dak Lak	Total
Illness of household member	28.5	26.8	19.6	23.5
Death of household member	6.1	3.5	2.7	3.8
Household member left the house	1.8	0.9	1.4	1.4
Person joined the house	1.2	3.0	2.3	2.1
Money spent for ceremony	1.9	1.5	1.2	1.4
Household Damage	1.3	0.4	1.3	1.1
Theft	1.4	1.6	1.1	1.3
Conflict with neighbor	0.1	0.3	0.4	0.3
Relatives/Friends stop sending the money	0.0	0.2	0.1	0.1
Flooding	13.1	14.0	5.6	9.3
Drought	4.6	3.2	36.6	21.2
Unusually heavy Rainfall	2.7	26.3	0.7	6.0
Crop pests	6.1	3.4	7.7	6.4
Storage pests	0.0	2.7	0.2	0.6
Livestock Disease	18.2	5.8	7.8	10.4
Landslide, Erosion	0.0	0.1	0.0	0.0
Job Loss	0.4	0.33	0.35	0.36
Collapse of business	1.17	0.87	0.65	0.84
Unable to pay back loan	0.27	0.19	0.21	0.22
Strong increase of interest	0	0	0.5	0.26
Strong decrease of price of output	0.13	0.17	6.55	3.51
Strong increase of price of input	0	0	1	0.52
Be in debt	0.65	0.33	0	0.25
Be in jail	0.13	0.03	0.14	0.12
Lack of farm land	0	0	0.21	0.11
Was cheated	1.06	0	0.14	0.38
Work abroad	0.39	0	0	0.11
Traffic accident	6.75	1.39	1.14	2.81
Storm	0.13	2.54	0	0.51
Built the house	0.38	0.19	0.28	0.29
Other	1.57	0.36	0.35	0.7
Total	100.0	100.0	100.0	100.0

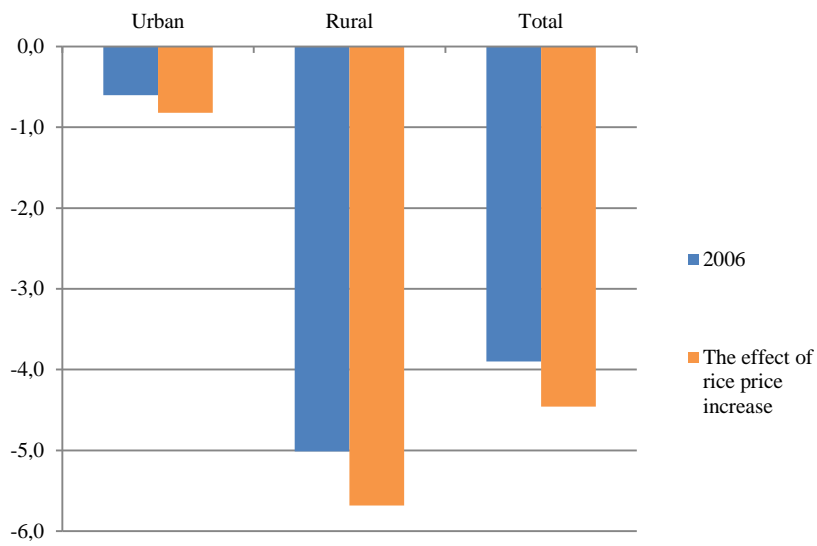Source: Author's calculation based on the data of the first survey in 2007 of the DFG project
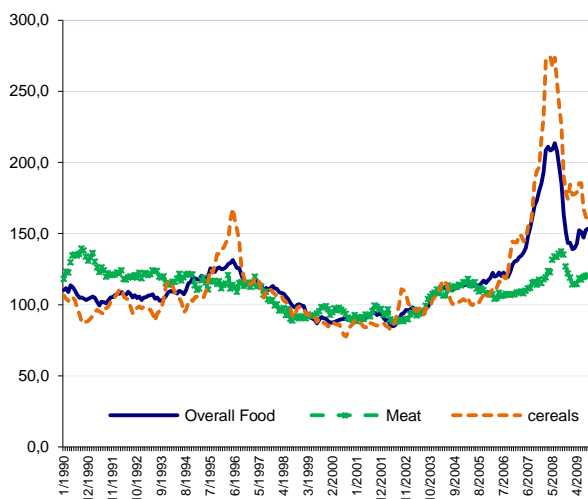
Appendix D: Food price index (%)

Source:Food Price Index- FAO
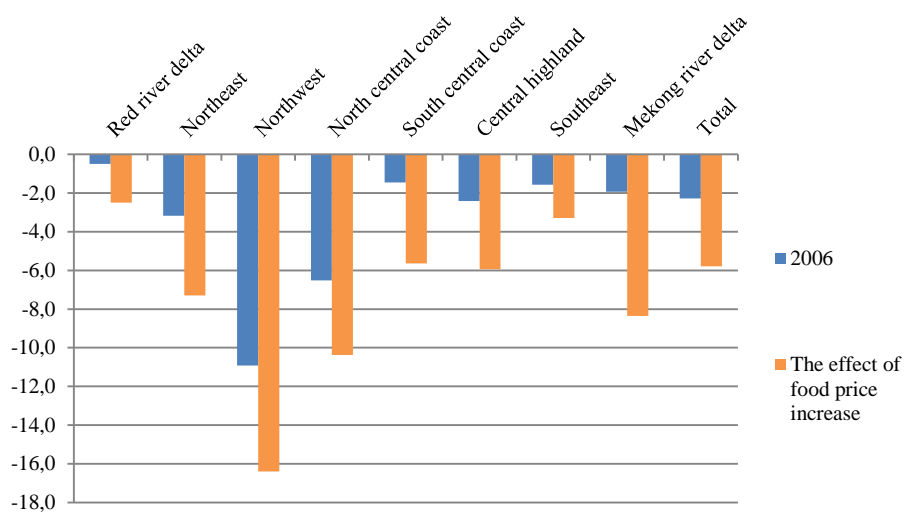
Appendix E: Impact of food price increase on poverty gap of net buyer

Source: Author' calculation based on VHLSS 2006 & 2008

Appendix F: Impact of rice price increase on poverty gap

Source: Author' calculation based on VHLSS 2006